Telephony.
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The Ideal Independent Telephone Association

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I have been asked to write upon the subject of organization among Independent telephone men. Compliance with this request by anyone must involve careful thought, not only on account of the serious problems presented, but because they have been and are being considered by some of the ablest minds. In common with most men who have watched the development of a gigantic industry from small beginnings within the past decade, I believe the same forces that have proved so potent hitherto, by what Max O'Rell termed the "sheer brute force of intellect," will solve these problems ultimately. In the meantime, I feel that developments which in their very nature are dependent upon the operation of economic laws cannot be forced. The telephone industry is affected by the same laws as any other, and the men engaged in it are neither better nor worse, neither more disinterested nor more selfish than their fellows in general. Competition is the life of trade, and as Mr. Dooley puts it "men must earn their money by scraping it off each other with a file." Any scheme of organization that aims to eliminate human nature and create angels for a special purpose must fail. The practical thing to do is to determine how the forces now in existence can best be directed to further the common interest without depleting themselves and without destroying the individual initiative which is at once the sure creator of healthy business conditions and the best guaranty of their continuance. American business men of all classes are rightfully jealous of the control by each of his own business, and telephone men particularly have never been remarkable for their lack of self-assertion.

There are three distinct classes of men engaged "in or about" the Independent telephone business in this country. First of these are the manufacturers, in which class I include not only those whose money is invested, but those whose brains direct. To these men, and particularly to the second class of them, belongs the major part of the credit for having built up the Independent business, and a number of them who are now in the capitalists' class have created their capital out of the business as they built it up. Second are the operators, including also capitalists and the active men of brains, many of whom are both. The third class comprises professional men, lawyers, engineers, journalists and others, whose employment grows out of the operations of the other two classes.

Of these three classes of men, certain motives and certain modes of action can be predicated with reasonable certainty.

The manufacturer is in business to make and sell goods at a profit. He constantly risks his accumulated stock, comprising money and goods, in his ventures; and his efforts will constantly be directed to two main ends, viz., to keep down the cost of production, and to increase the value of his output. The first end can be attained either by cheapening his processes of manufacture or simplifying the character of his goods or both; and the second by enlarging his market, forcing his sales, or selling at high prices. Competition compels him to maintain the standard of excellence in any case.

The operator seeks to install his plant as cheaply and to maintain it as economically as possible. As against his desire for a low first cost, he is forced to adhere to a certain standard of excellence by two considerations; first, the necessity for satisfying the public, upon whom he depends; and second the necessity for keeping down operating expenses and the cost of maintenance. Many an operating concern in the Independent field has learned the lesson by bitter experience that a penny saved in the beginning is often a dollar lost in the long run.

The third class, theoretically speaking, ought to be the happiest, but experience does not justify the theory. While they are not directly subject to the specific trials and risks of either manufacturer or operator, they have troubles of their own. The technical newspaper man in particular must have quite as much tact as his non-technical brethren if he would satisfy, and not imperil either his advertising or his circulation. For obvious reasons he must cater somewhat to the manufacturers, and must also have constantly in mind the advantage of his subscribers. His principal function being to act as a medium of communication, he must retain general confidence, and to do this he must be reliable. This, I believe, most newspaper men endeavor to be, in spite of the small credit they get for it.

Having thus briefly reviewed the personnel of the business, there are two questions to be asked—and answered. Can these classes be amalgamated on any kind of a reasonable basis to form a harmonious if not a homogeneous organization? If they can be, what benefits will result?

The second question must be answered first. There are a number of most important ends that may be attained by the organization of a strong, permanent association. Assuming that it is actively supported, here are some of the things it can do:

It can help the manufacturer:

As each individual manufacturer endeavors to keep down his cost and increase his sales he will make improvements in the factory and he will resort to all sorts of methods to move his product. In improving and cheapening his designs the association can save him money and give him security by furnishing his counsel and engineers with information otherwise obtainable only at considerable cost. If in the progress of events disagreements arise or infringement is alleged, the

association can save both parties time and money, and the Independents at large injurious scandal, by arbitration, cases being presented by counsel if desired. In widening his market the association can help him with information in detail concerning men or companies, plants or franchises. It can help him against unfair competition, for example by ensuring that a purchasing agent who accepts a bribe, if discovered and reported will be permanently out of a job, and will be properly advertised beside, through official channels. It can help him against any other manufacturer who violates commercial decency and fairness by deliberate infringement, misrepresentation, or the like (if after due presentation of proofs the governing body is satisfied as to the offense). It can help him by keeping him in touch with its members without forcing him to sacrifice his self-respect and squander his profits in so doing.

It can help the operator and investor:

By hammering it into the public that fair rates are essential to good service, and that the larger the exchange the higher the cost per line of installation and maintenance.

It can help raise the dignity and standing of the business generally, and wipe out the recollection of early wild-cat days.

It can show the legitimate investor where and how it pays to put in a good plant in the first instance, and it can hold up the fly speculator who builds cheaply for purposes of sale only.

It can protect the investor as well as the builder in many other ways, as by furnishing reliable data, and by compelling (if persuading is impossible) companies generally to keep up to a certain standard of plant and service. It can act as a national clearing house, with local branch clearing houses, for the interchange of information and of values. It can give impartial and unbiased opinions as to questions of possible patent infringement and of engineering, these preferably through the counsel or engineers of companies.

It can help the lawyers, engineers and journalists:

By co-operating with them in all their efforts for individual clients or for the field at large, so far as an impartial agency can do so. Any of these men can think of a dozen ways in which an association bureau could help him, without in the slightest invading his prerogatives. For example, in furnishing assistance in defending suits affecting members. Such assistance would likely be limited to information, but it would be valuable at that, and it might extend to financial aid, as it has heretofore (by the backing of manufacturers).

No great movement ever succeeded through sporadic efforts. The German army was victorious in the war of 1870, not because of separate battles won at different points, but because of intelligent co-operation directed from a common point, and also because of complete detailed information of every part of the country it was destined to overrun. The press clipping bureaus, and the telephone journals give efficient service, it is true, in a way, but that service is intended principally to further the sale of goods, and it by no means meets the needs of the financier or investor.

The first question asked remains to be answered. Can the classes be amalgamated properly? The answer is this—they can if the proper methods are adopted. They cannot be properly amalgamated by mixing up generally in an annual meeting, expecting one class alone to spend all the money and do all the entertaining as well as guarantee all the legitimate expenses of the crowd. This has been a crying injustice to the manufacturers, and the good men and strong men among the operators know it. It is wrong for another reason, that it does the operators injustice. If the members of one class pay all the expenses of any institution they are entitled to regard it as a thing for their own principal use and behoof and may treat it accordingly. It is scarcely necessary to say that no association of this character will ever be truly representative or command general respect if controlled by one class only.

Having said this much, I will endeavor to sketch out a practicable scheme for such an organization as would really be representative, dignified, useful, impartial, and in fact what the Independent Telephone Association, by whatever name it is known, ought to be. At the outset I will lay down some few rules as to what the association must not be and must not do, which will help in determining what it must be and must do:

(1) It must not exist without clear and definite purposes.

(2) It must not be a thing without real power and authority for its purposes.

(3) It must not be controlled by or limited to any one of the three classes of men in the business, only.

(4) It must not interfere for or against any manufacturer in his business.

(5) It must not attempt to control or dictate to any operating concern in matters affecting itself alone, nor in any matters without a local connection and accurate information as to local conditions.

(6) It must not be made an appendage to existing commercial bodies, nor take any part in commercial business.

(7) It must not be dependent upon voluntary subscriptions or charity for its maintenance.

A scrutiny of the above negatives will enable us to formulate at once a number of important positives. Taking the negatives in order, I will take up the positives in the same order.

The organization must have purposes beneficial to all engaged in the business, and these not sentimental purposes, but immediately useful from a business standpoint. I will not go into all these that might be mentioned, but will content myself with referring to a few:

Provision should be made for the collection of accurate statistics from all parts of the Independent field, and of all other fields that might furnish valuable data. These statistics need not be made public, but would be of immense value to members of the association, and should be controlled by the governing body. They would be invaluable in financing, and could also be taken as the basis for taxation. They should be furnished by local bodies on forms provided by the central body, and should be kept up to date by a regular system of reports on similar forms through the same channels at stated intervals.

Provision should be made for systematically educating the public and strengthening the market for securities by the dissemination of accurate information. Encouragement and assistance should be given to and in the exchange or passing of securities, by the finance committee or other body, serving merely as a bureau of intermediation between parties, and not itself as a party to transactions for profit.

Provision should be made for assisting in standardizing construction work and the general types of apparatus employed, without interfering with the freedom of selection of specific makes of goods. A system of special reports to members might well be adopted, similar to those of the National Underwriters' Association.

Provision should be made for the systematic collection and use of information on patents. Such information would also be under the control of the governing body, and could best be handled by a disinterested and impartial expert retained by the governing body, who would be a valuable auxiliary to counsel and experts retained by manufacturers or others to prosecute or defend suits.

In connection with the patent bureau, provision should be made for all disputes arising under patents or supposed cases of infringement to be submitted, for arbitration and settlement if possible out of court. The importance of having an absolutely confidential bureau for this purpose, under the control of the governing body and directed by an absolutely impartial and disinterested trained expert, will be apparent. Cases might well arise where only one party was a member of the association, and yet the official submission

to the association bureau would prevent a suit. With the constant multiplication of patents, large numbers being taken out by the various independent manufacturers, as well as by the Bell company, litigation among the "Independents" themselves is almost inevitable, but should be avoided if possible for two reasons, first, because of its bad effect upon investors, and second, for the sake of economy.

Provision might be made for a general board of arbitration, composed of members from the different districts or states; and to this board many questions in dispute might be referred for settlement.

Provision should be made for meetings at stated intervals, at which, as at present, the necessary elections of officers, rendition of reports, and the reading and discussion of papers, should be had. These, with the usual features of social intercourse, exhibits by the manufacturers, and the incidental visiting of points of interest at meeting places, have of course characterized the existing bodies. They are indispensable for any association, but obviously they do not fulfill all the required conditions. The proceedings at these meetings are reported at some length in the telephone journals; but in a thoroughly organized association all matters of permanent value, such as reports of committees, and the like, should also be officially communicated to each member, in such form that a complete file of the association publications and reports could be kept together for reference.

To be permanent and continuously useful, the association must have power, and the exercise of its power must naturally be entrusted to its officers and governing bodies. In accordance with the general underlying principles of all similar institutions such officers and governing bodies to be really efficient must be truly representative. This follows also from a consideration of the second and third negatives we have laid down. But the difficulties in the way of selecting representatives to a single central body of manageable size where the individual membership is as diverse and widely scattered as it must be in the Independent telephone business throughout this country, are apparent at a glance. It follows that state or district bodies must first be organized, somewhat after the fashion of the state legislatures, these in turn to send their chosen representatives to the central body. Other reasons besides the difficulty of organization would appear to dictate this policy. In all organizations the collection of membership dues and the handling of finances from a distance are difficult. The proper collection of statistics and handling of reports from a distance are equally difficult. For such purposes local organizations are almost indispensable. It should also be noted that in assisting, controlling, and within limits directing the methods and operation of members, it is indispensable to be in direct touch therewith. The fifth negative touches on this point.

Suppose the entire country to be districted in any convenient manner, as by states and groups of states, each district being determined by the approximate possible amount of taxation. Let each district then have its governing body composed of representatives from the individuals and companies therein, the amount of representation or the number of representatives being determined in proportion to the tax paid in any case. Each district body should select its own officers and should work under its own constitution and by-laws. The ultimate development of such organization would of course be the incorporation of each district body, whereby it would gain the power to enter into and enforce contracts for purposes within the scope of its charter, while the liabilities of individual members would be strictly limited. A number of incidental advantages would flow from such incorporation, such as the power to hold and transfer securities, and the like.

The district bodies, according to this scheme, would elect the delegates to the national body, exactly as the state legislatures now send their representatives to the United States Senate.

A difference would have to be observed, however, in this, that the number of delegates from any district to the national Senate would be determined by the number of members in the district body, that is to say by the taxation in the district. This national senate might also be duly incorporated, its shares being held by the district bodies, as its income would be derived from the district bodies, amount of tax in each case being determined by the number of delegates, that is to say by the membership or national tax roll of the district.

Some such organization as this which I have briefly outlined will undoubtedly come about in the near future, by natural evolution, unless some enterprising group of capitalists succeed in obtaining control of the important centers and ultimately organize a single overlying company on the plan of the American Bell. At the present writing, this contingency does not seem likely to occur, and its advent would naturally be resisted by most of the manufacturers, for any consolidation of the operating interests of the country must inevitably be accompanied or followed by the manufacturing of their own equipments. Such a trust might take in some of the large manufacturers, but not all. Another strong reason against the present formation of any trust arises out of the possibility of radical changes in central office equipments in the near future. The work of rebuilding thousands of the existing changes, whether with automatic or up-to-date manual apparatus, can best be done by individual companies under the auspices of a strong national association.

The district governing bodies to which I have referred would naturally have exclusive jurisdiction in all matters arising within their own districts, the national senate would have jurisdiction in all matters affecting more than one district, and in matters arising between district governing-bodies; and in general it would be a national clearing-house for the convenience of individual members throughout the country. Its revenues should be sufficient to cover routine expenses, such as the gathering and arrangement of statistics, printing, correspondence and patent work. A certain amount of expert work would be required, as in the preparation of special reports to members, and the like, and for this, a charge should be made. All special expenses, such as those incident to patent arbitration, should be met by taxing the costs on the parties to the controversy; and these need not be heavy.

So far it might seem that the plan would apply to operating concerns alone. This is not so, however. The scheme of taxation could easily be so arranged as to permit the entry of a manufacturer into any district, and his sending a delegate or delegates to the district body, in number proportional to the amount of tax which he is willing or is permitted to pay. Another plan would be to form a separate artificial district for the manufacturers, who would thus have their own local governing body, possessed of great power and influence, as it should be, fully competent to deal with difficulties arising between its own members if it so desire, and able to certify them to the national senate for decision there if desired. This manufacturers' district body or union (!) would of course send its own delegates to the national senate, and a very salient advantage in having the manufacturers thus primarily associated together would be that no one concern cou'd gain a real or fancied advantage over the others by making subscriptions which they would have to cover or be damaged in the eyes of the operating people.

It remains to consider the relation of the third class of men to this association. It would be two-fold. Membership would be open to professional men and journalists upon payment of such per capita tax as might be fixed by their nearest district bodies, but the scheme would not contemplate membership of these men as a rule. Their usefulness would not depend upon membership in this association, nor would their business relations be affected by it. The lawyer or engineer is retained by the individual manufacturer or oper-

ating company; while the technical journal is a medium of communication, and would be recognized as such and treated accordingly by the national senate as well as the district bodies, without membership. In this connection it should be noted that at present there are several technical journals in this field. If there were but one, that one would naturally be the official organ of the entire association. Under the present plan, there would be nothing to prevent the district bodies from selecting official organs if they so desired, and one or more of the district bodies might thus be served by each of the journals referred to. The national senate, however, should be independent, and should have no organ except its own official publications.

It is scarcely necessary for me to go into detail as to the business organization of any of the governing bodies. I will say, however, that the office of the secretary of the national senate, under this plan, would not only be a busy place, but would require a man of special training and ability to run it. The patent and other bureaus should be under his direct charge, to insure the proper care of all records, and it is not too much to say that with these statistics and the information regarding patents, etc., that would accumulate in a comparatively short space of time, these records would be of immense value to all the members of the association.

The benefits derivable from such an organization by everyone in the field, seem apparent. All the advantages of acquaintance, mutual support in patent suits, etc., that have flowed from previous associations, would be preserved and increased. The mere existence of statistical reports would operate as a check on unscrupulous local organizers, and the information gathered would be invaluable to the manufacturers as well as to investors and operators. The adoption of a general standard for construction work would be furthered, and impartial expert information in the shape of special reports, which could not otherwise be obtained without considerable expense, would be obtainable by every member of the association, be he big or be he little. If the system of arbitration of differences, whether arising from infringement of patents or otherwise, should be generally adopted or should be made compulsory before resorting to the courts, a sense of security would be created; for such action within the Independent ranks would argue well for united resistance to attack from without. In the event of such attack, which is not uncommon now, and which will probably be more common in the future, counsel and experts for members would find a welcome, reliable and economical source of information and assistance in the national bureau. For any of these purposes, however, and particularly for arbitration, the bureau, to be of value, must be above the suspicion of partiality.

In closing, I wish to say that while the ideas advanced in this essay are my own, they have met with the approval of many representative operating and manufacturing men to whom I have broached them. I believe that a structure to be substantial must be built from the bottom up, not from the top down. If the strong men in the operating concerns take hold of the matter in earnest, it will be brought about, and that action can be greatly facilitated and accelerated by what happens this next month in Chicago. A call for state organizations to send in national delegates would meet with a fair response if understood, and kept before the people. Once started, the organization would be self-perpetuating.

In the near future some scheme of selection will be indispensable. In the past the representative men have naturally come to the national councils; but in the future, if a man is not big enough at home to sit in his district, he ought not to be boosted into a national council. To acquire and retain confidence, selection is imperative.

There are four thousand telephone patents issued in this country. There are three or four times that many Independent exchanges in existence. If the telephone people want to know what they are doing they should be served by an organization that works all the time, not once a year, that works steadily and quietly, not making one great hurrah and then going home.

Program of the Interstate Convention

The third annual convention of the Interstate Independent Telephone Association will be held at the Auditorium Hotel, Chicago, on December 8, 9 and 10, 1903. Any corporation, copartnership or individual interested financially in, or operating, an Independent telephone exchange or toll line, or any corporation, firm or person engaged in manufacturing any kind of Independent telephone apparatus or equipment, or any supply house, is entitled to membership, and all are invited to attend the coming convention, which, it is hoped, will be the largest and most enthusiastic gathering of telephone men in the history of the industry.

In a circular letter which E. M. Coleman, the association's secretary, is sending broadcast to telephone men he calls attention to the value of these conventions and claims the convention will be the most important meeting of business men ever held in this country. After urging a full attendance, he concludes:

"This is the critical time in the telephone business, and somthing definite along practical lines must be accomplished at this convention to protect your interests and your investments.

"This will be a business convention and you should be present to help shape the destiny of Independent telephony.

"We cannot separately successfully fight an organized enemy. Your money and the greatest good of the general public looks to you to meet us and join hands with us in this struggle.

"Vital questions will certainly be discussed and determined.

"In addition to the vital and all-important business to be transacted, royal entertainment has been provided.

"First. An elaborate banquet, surpassing that of any former convention, will be given.

"Second. A magnificent musical feast, a great innovation, to delight our delegates and guests, Cregier's Grand Orchestra of forty men will thrill and inspire the hundreds present.

"Notify the secretary at once of your intentions to be at the convention, in order that proper arrangements can be made for your entertainment. Act quick, time is short."

The program for the three days' session follows:

TUESDAY AFTERNOON, DEC. 8, 2 TO 5.

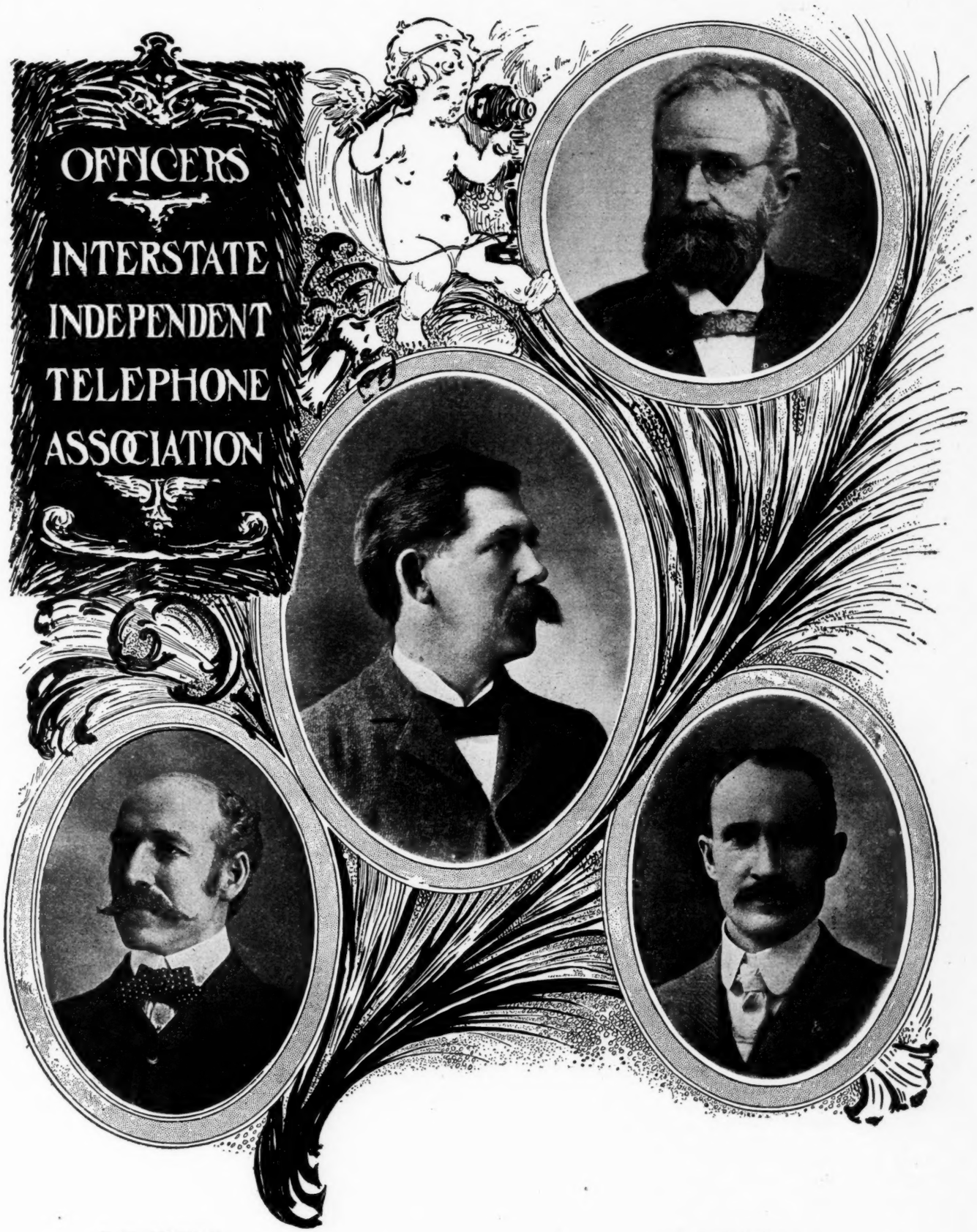
Address of welcome—Hon. Carter H. Harrison, mayor of Chicago.

Response and annual address by president, Senator C. E. Hull, Salem, Ill.

Report of the secretary.

Report of the treasurer.

Selection of executive board.



E. M. COLEMAN,
Secretary,

CHARLES E. HULL,
President.

J. W. LAYNE,
Treasurer.

L. A. FRAZEE,
Secretary.

Selection of nominating committee.
Revision of constitution and by-laws.
Adjournment.

WEDNESDAY MORNING, DEC. 9.

The officers and executive board will take care of the delegates from 9 to 12.
Visiting exhibits.

WEDNESDAY AFTERNOON, DEC. 9.

"Should the territory of the Inter-State Independent Telephone Association be enlarged, and if so, why?" Hon. John Van Nortwick, Appleton, Wis.
Discussion.
"Are our telephone periodicals sufficiently careful as to the business relations sustained by contributors?" W. H. McDonough, New York, N. Y.
Discussion.
"Standardization of apparatus." Prof. J. C. Kelsey, Purdue University.
Discussion.
"Standardization of construction." W. C. Polk, Kansas City, Mo.
Discussion.
"Competition between Independent companies and farmers' mutuals." O. Rex, Manchester, Ind.
Discussion.

THURSDAY MORNING, DEC. 10, 9 TO 12.

"Independent toll line systems, and is the time ripe for merging?" J. S. Brailey, Jr., Toledo, O.
Discussion.
"Where should the line of demarcation be drawn between Independent operating and manufacturing companies, and the Bell company?" Hon. Henry A. Barnhart, Rochester, Ind.
Discussion.
"What should be the representation in the convention of the Interstate Independent Telephone Association in voting?" David Prewitt, Winchester, Ky.
Discussion.
"Who is who? What are the true ear-marks?" Hon. Theodore Gary, Macon, Mo.
Discussion.
Election of officers.

THURSDAY AFTERNOON, DEC. 10, 2 O'CLOCK.

Officers and executive board will take charge of and entertain the attending delegates.
Visiting exhibits.

A special rate of one and one-third fare for the round trip has been granted the association. All attending are advised to purchase a first-class ticket and at the same time procure a certificate from the ticket agent. If through ticket cannot be secured get a certificate from each ticket agent where purchase is made. Tickets for return passage at one-third fare only to certificate holders after said certificates have been duly signed by the secretary of the association at the Auditorium Hotel on the dates of the meeting. Certificates are not transferable and are void if purchased longer than three days prior to the meeting. The officers and executive board of the association are:

C. E. Hull, president, Salem, Ill.; L. A. Frazee, vice-president, Connersville, Ind.; E. M. Coleman, secretary, Louisville, Ky.; J. W. Layne, treasurer, Carthage, Mo.

Executive board: A. B. Conklin, Aurora, Ill.; H. S. Herr, Ottumwa, Iowa; O. Rex, North Manchester, Ind.; A. L. Hutchinson, Weyauwega, Wis.; E. H. Moulton, Minneapolis, Minn.; W. Guy Jones, Columbus, O.; W. F. Hall, Clinton, Mo.; J. B. Ware, Buffalo, N. Y.; David Prewitt, Winchester, Ky.

CANADIAN TELEPHONE LEGISLATION.

The legislation committee of the convention of Canadian municipalities, at Ottawa, last month reported on the present position of telephone legislation in the Dominion House. The following are extracts from the report:

"During the session of 1902 the minister of justice had given his promise to introduce a general telephone bill which should contain some improvements in favor of our cause, the justice of which he admitted. As the work did not seem to proceed after a certain point, the executive requested an interview, and met him at Ottawa by appointment on the 6th of February last. We placed before him the wishes of the municipalities, and particularly their desire to control their streets and local franchises. He promised attention to the matter, but when the session arrived nothing was done. It became apparent that other influences had been working against his desire to assist us." After co-operating with W. F. Maclean, M. P., in improving his telephone bill of the previous year, a special sub-committee of the railway committee of the House of Commons was formed and numerous meetings held. "The hostile influence, however, appeared to affect the operations of the special committee, and delays were systematically raised which made it in the end self-evident that no real progress was desired by some of the members."

The report then goes on: "As you are aware, the Bell Telephone Company, has a practical monopoly in Canada, and has obtained powers from the Dominion Parliament and the legislatures of some of the provinces by which it tears up and obstructs streets at will. It is not the only company which does so, but its operations are more widespread than those of any other, and it will likely be enabled to maintain its monopoly to a considerable extent throughout the whole country until control of the franchises is ceded to the municipalities. It has been claimed by our opponents in this matter that we advance the principle that one municipality could hold up a through line of a useful character running through several municipalities. We wish it understood that we have always as a union conceded a reasonable right of passage to get through one municipality to reach another. An opposition telephone company, called the Canadian Telegraph and Telephone Company, has recently been incorporated by the Dominion Parliament. It was readily induced to incorporate such amendments conceding the question of municipal control. We are informed on good authority that this company represents solid and well known American Independent telephone men. The great Independent telephone movement in the United States is deserving of study by Canadian public men, and disproves the fallacy of many of the claims made on behalf of monopoly. The bill of this particular company is worth the attention of municipal lawyers.

"If control of the local franchise is granted throughout Canada, as we have been asking, it does not necessarily mean fundamental injury to the Bell Telephone Company. That company would merely be compelled to turn its attention to obtaining exclusive franchises from municipalities, and doubtless would succeed in obtaining a large number of these by granting reasonable terms and good service, it having the great advantages of large capital and full connections, and of being the first in the field. The ideal system would be government control of all long-distance connections, and either government or municipal control or ownership of the local franchises, the latter being either worked by the public or leased by contract. It is only by some such means that we can rid our streets of unsightly poles and obtain satisfactory rates and a fair compensation for the use of highways."

The British island of Guernsey, in the English Channel, has a state telephone system. The number of lines is 1,073 the population being 40,300.

Independent Telephone Systems.*

By J. J. NATE.

In concluding this subject, a brief resume of what has been accomplished, and the situation in the Independent telephone field as it appears to-day may not be inappropriate.

First, we will take the fifteen largest cities in the United States:

New York, N. Y.	Bell.
Chicago, Ill.	Opposition plant nearing completion.
Philadelphia, Pa.	Opposition company growing steadily.
St. Louis, Mo.	Opposition for several years; Independent service eminently satisfactory.
Boston, Mass.	Bell; small Independent plant established.
Baltimore, Md.	Opposition; second plant in operation.
Cleveland, Ohio.	Opposition strong and vigorous.
Buffalo, N. Y.	Opposition.
San Francisco, Cal.	Bell.
Cincinnati, Ohio.	Bell.
Pittsburg, Pa.	Opposition.
New Orleans, La.	Opposition.
Detroit, Mich.	Opposition; construction work again under way.
Milwaukee, Wis.	Bell.
Washington, D. C.	Bell.

With eight of these cities equipped with magnificent modern plants, furnishing a service superior to that which the people were compelled to submit to in years gone by, we can more than hope that with the growing strength of the Independent movement, the remaining cities will see established within the next two years strong and vigorous Independent properties.

The year 1903 has witnessed the installation of magnificent plants in Los Angeles and Buffalo. Work has again been resumed at Detroit by the People's Company. The plant at Kansas City is nearing completion. The contract has been awarded for the apparatus for an Independent plant at Atlantic City. In many of the smaller cities, franchises have been granted and work is progressing to-day at Chattanooga, Tennessee; Council Bluffs, Iowa; Oakland, California; Omaha, Nebraska; Oshkosh, Wisconsin; Denver, Colorado; Quincy, Illinois; Reading, Pennsylvania; Sioux City, Iowa, and Salt Lake City, Utah.

The establishment of the Independent exchange at Los Angeles has brought into the fold Pasadena, Santa Barbara, San Barnardino and other cities in lower California. A company has been organized, and preliminary steps have been taken for the development of the Independent work covering the entire state of Utah. The Texas Independent movement has received a fresh impetus in the financial interest taken by Mr. Huntington and others in this proposition.

In New York state, with the exception of possibly half a dozen cities, the Independent plants are in magnificent shape. Throughout Ohio, Indiana, Illinois, Kentucky, Iowa, Wisconsin, Nebraska, Kansas and Michigan, the list of subscribers has increased despite all opposition on the part of the Bell company, and the toll line growth in this field has added many thousands of miles to the magnificent plants already in operation. In Minnesota and the Northwest, the Tri-State Independent Toll Line Company are just completing a series of toll lines which will bring Minneapolis in connection with the cities of southern Minnesota, through LaCrosse, Wisconsin, and so on to Madison, the capital of that state. Another line connects at Blue Earth with the Iowa Independent toll lines, and still another follows the Minnesota Valley to Winthrop, connecting with through lines from Sioux Falls and Yankton, and projecting through to Omaha and Lincoln, Nebraska, and other prominent centers throughout that state. The northern line will be connected in the spring from Grand Forks and Fargo to Minneapolis. The Duluth and Superior line to Minneapolis is over-crowded, and another circuit will have to be added. The class of construction employed is of such character that long distance communication vies with the Bell in efficiency. Manufacturers have kept pace with the demand for improved apparatus for long distance service, and the Independent operator to-day can purchase all necessary material of the highest grade for the most exacting service. Technical and well-informed engineers are developing the possibilities of the Independent work to a most remarkable degree. Simultaneous telegraphy and telephony, and duplex telephony, are being practiced in their work and the highest arts known in telephone craft are rapidly developing.

Capital has fearlessly entered the field, and the men who are financiering our largest telephone properties are using broad-gaged methods with discernment and ability.

The tendency to consolidate in groups has brought about many beneficial results, eliminating differences as to toll rates, supplying adequate equipment in those exchanges constructed in the earlier years, and cementing more strongly than any other factor the Independent interests of the country.

Farming communities, which for so many years have been ignored in the matter of telephone service are developing to a marvelous extent, and the past year has witnessed the construction of thousands of miles of farm lines, furnishing service to perhaps two hundred thousand farmers. The class of construction employed in this work has been steadily improving. These lines are centering in our exchanges, and the farmer is enabled to telephone from his home to distant points.

The sentiment which has built up the Independent telephone business in opposition to the Bell monopoly, is stronger and more deeply seated to-day than ever. The fight may be said to be truly on, and with the continuation of the excellent service furnished by the Independent companies, its future success is assured.

The information derived from so many sources, and which I have endeavored to present to the Independent telephone people in a comprehensive manner, through the pages of TELEPHONY, has been secured only by conscientious and constant effort. The disposition everywhere has been to help the work along. There has been no attempt to gloss over unfavorable conditions, and, with the exception of a very small percentage, I may claim accurancy for the general treatment of the subject as outlined in previous papers.

In connection with Independent telephone systems I desire in conclusion to call attention to the hard, earnest and conscientious work performed by the laborers in the field, and I bespeak for them that same consideration which the public has had for the Independent operator. The unfair policy of the Bell people, in their treatment of many worthy men, has driven into the Independent field some of their best talent, and in the employment of that talent, let us see to it that justice is accorded these men to whom we owe so much.

*This is the concluding article in this series.

London, the largest metropolis in the world, is far behind the other world capitals in the matter of telephone service.

Ether-wave Signalling

JOSEPH B. BAKER

The public attitude towards new inventions and towards the progress of science generally, has wonderfully changed during the past generation. Time was when a thing that was new-fangled was looked upon with suspicion and ridicule, but now everything new, from flying machines to submarine boats is received by the public in a spirit of hopeful appreciation. It is hard now to understand the spirit that was abroad in the land as long ago as the first proposal by Professor Morse to send messages by "electric telegraph." There is a classic story of a backwoods congressman who sought to gain favor with his constituents by announcing his stand upon the measure that had come up in congress during his just-expired term of office, the appropriation at first unsuccessfully asked for by Professor Morse's supporters. Our congressman's auditors, such of them as had been to school, were no doubt familiar with the shiny brass and glass electric machines that accumulate dust in back country high schools; and so when he told them that his political opponents had actually voted money to send messages over wires by electricity, he no doubt felt that he had pointed out a dramatic absurdity likely to be the undoing of the candidate on the other side. But it is no use to laugh too much at this highly possible incident, for when the electric telegraph did come the agent that was its soul seemed a very different thing from that causing blue and pink sparks in the schoolroom. The process of making use of this same electricity has widened our knowledge out of all possible anticipation by philosophers of earlier times. However it may be, public opinion is now cowed, as it were, by the knock-down blows of fact and achievement that have many times within the last thirty years followed "theorizing." It is no longer the thing to sneer and ridicule; that fashion has passed just as definitely as the previous one of inquisitions and witch-burning.

To get a little closer to the present subject, is it being appreciated how many different kinds of "rays" are being discovered and loaded upon our every-day knowledge by the army of workers that have followed the deeds of Hertz, Roentgen and the Curies? The alphabet from N on through X, Y and Z is being called upon to name these different sorts of radiation, some of which will photograph a mouse through three thicknesses of plank in thirty seconds, and others which travel with a speed of only one-tenth that of ordinary light, et cetera, as the case may be. Our very conceptions of matter is here awaiting the result of the co-ordination of these discoveries; for the very latest step that has been taken, the discovery of radium, has thrown the beginning at least of what will become a substantial bridge over the gap between what we have always called "force" and what we have never known much about as "matter." We are told by grave and reverend professors, whom we must believe, that a single pound of radium all together in one place would cause destruction such as cannot well be imagined; and that electrical inertia is probably the only inertia, that more familiar kind which pertains to matter in virtue of its mass being only a special case of the universal electrical kind. All of these things, steps of progress as they are, mean the converging of knowledge and the widening of individual research. The extent of the subject has been well and strikingly presented by an English authority on radiation, who states that if all known wave-lengths were plotted upon a scale of wave-lengths, from the longest known waves in nature to the shortest, the length of the scale being the mean radius of the earth's yearly orbit about the sun, the aggregate spaces occupied by forms of radiation now known and just discovered would amount to a length of a small fraction of an inch. This shows that there is still something to be done, even in this recently very active field, and should bring comfort to people who fear that there are nowadays precious few more scientific worlds to conquer.

The whole group of the so-called "electric waves" forms a tiny portion of this *terra cognita,* and wireless telegraphy is concerned with a special class of these electric waves, namely, the longer ones only. The subject begins, if one can set a definite beginning to any scientific discovery, with the name of Hertz, in 1879, when he had a problem set him by his master, Helmholtz. It is interesting that the problem had very little to do with the work of Hertz that was destined to be the foundation of wireless telegraphy and telephony, its only office being to turn the attention of the young scientist to experimental work with the mathematical speculations of the Englishman, James Clerk Maxwell, that was destined to raise both these names to the eminence of a Faraday or even a Darwin. Beginning with work "On Very Rapid Electric Oscillations," Hertz carried his investigations within the next few years through a whole new domain of experimental science, giving to the world a new set of ether waves obeying the same laws as those of light, but ranging much longer than the longest waves hitherto known as "radiant heat." It was with just such brass and glass school-room apparatus that had come down with little essential change from the time of Franklin (but how well dusted off for the occasion!) that Hertz demonstrated that the ether could transmit an electric blow or stress just as it does a luminous one, and so gave a means of verifying to all the predictions of Maxwell, not then generally accepted. The names of Lodge, Branly, Bose, Righi and Marconi follow along at this period, each with its share of the essential work that lies at the foundation of ether-wave communication. It is to Lodge that we owe a brilliant interpretation of Hertz's work and, later, some special fundamental ideas concerning the more modern aspect of syntonic or tuned space telegraphy. To Professor Branly we owe the "coherer," which first made commercial "wireless" a possibility in the hands of Marconi and others. The Calcutta professor, Bose, and Righi of Bologna took up the electro optical experiments performed or indicated by Hertz, and carried them to greater refinement. It is to Righi that Marconi owed his first inspirations; the idea occurred to him that by the use of bigger apparatus, more powerful radiators of electric waves, and by refinement of the ingenious detector of such waves that had been partially developed by Branly, Lodge, and others, a real and new art of "telegraphy without wires" might be developed. The history of his strenuous efforts is an interesting and inspiring one. Beginning with Righi apparatus, and benefitting by that scientist's encouragement, he got "actual results" over short distances in Italy. Then, bringing his crude devices to England "in a sealed box," as Professor Lodge does not neglect to inform us, he made so favorable an impression upon the conservative British post office that he enlisted its powerful aid. Next we hear of him making use of big metal parabolic reflectors, and working through distances up to two miles over Salsbury Plain. At this date an inspection of his first patents reveals the germ of the "vertical wire" idea which almost immediately replaced the reflectors of Righi, never to be used again. It became at once a matter of higher and higher vertical wire wave emit-

ters or "ærials," of greater distances, increasing by leaps and bounds, of daring and successful innovations in the apparatus working under new principles discovered and developed by sheer genius. The almost daily growing history of space telegraphy became the personal history of the young Italian.

What is "ether-wave signaling?" It is the art of striking an electrical blow; of uttering an electrical shout at one station, and perceiving the blow or hearing the shout, with a highly special receiving device, situated at another station, by the transmission of an electric strain through the ether that fills all space. If you have a steel rod with one end clamped in a vise and with the other end pushed to one side against the stiffness of the rod, you will have stored up energy in the rod; will have gotten ready to upset the equilibrium of the air surrounding it. When you suddenly release the rod, what we call a musical note will be perceived by a distant ear, which is merely a device provided by nature to perceive that kind of a disturbance. So also the art of wireless telegraphy rests upon the sudden upsetting of an artificially established electrical equilibrium in a vertical conductor at a transmitting station, whereby an electric wave is propagated in all directions through the ether with the speed of light, till it reaches the special device invented to perceive minute, sudden, electrical variations. When an induction coil in operation is connected to the "ærial" of the sending station, the ærial is charged with electricity at a tension that increases until the instant that the air space that separates the ærial from the earth can no longer stand the strain. Now, the charge upon the ærial means that a stress is set up in the ether surrounding, and when the charge suddenly collapses, as it does when the spark passes between the foot of the aerial and a wire connected to the earth, the sudden jerk or release of the all-pervading strain is felt by the coherer connected to its aerial at the distant station. The jerk in the surrounding ether, due to the passage of each spark of which a series constitutes a dot of the Morse alphabet, and a longer series a dash, is a very sudden one. That is, what happens when the sending key is depressed and a spark passes between the brass knobs constituting the spark gap at the foot of the transmitting station's aerial is this: The induction coil generally used to charge the aerial works rapidly in the ordinary sense of that word, but almost unimaginably slow when compared with the rapidity of electric action that comes when the spark passes. There is, in fact, a smooth and relatively slow building up of electric charge upon the aerial, insulated as the latter is, up to the time when the difference of potential due to the charge reaches a magnitude which enables the potential to break down or puncture through the layer of air between the knobs of the spark gap in establishing electrical equilibrium between the aerial and the earth itself, the earth being regarded as at zero potential. Electricity is piled upon the aerial, as it were, until the weakest support of this load (the air insulation of the spark gap) suddenly gives way, allowing a sudden rush of the electricity through the spark gap; the sudden rush constituting an exceedingly powerful momentary current in the aerial, whose passage at such a high rate of speed is the actual means of delivering the necessary sudden electrical blow to the ether surrounding. The aerial must, then, be regarded as a periodically charged conductor, so situated with reference to the earth that a sudden "slopping over" of the electrical charge upon it will administer a sudden blow to the equilibrium of the ether itself. As a matter of fact, this slopping over carries the electric charge too far (that is, beyond the point of equilibrium) because it has inertia, and the charge flows back and forth in a gradually decaying oscillatory current, giving rise not to a single blow to the other but to a train of ether-waves or disturbances that gradually but rapidly die down. If a log floating in a mill pond were lifted exceedingly slowly so as not to cause any ripples, and then released, its comparatively sudden fall and its bobbing up and down would cause a great commotion in the water, and the ripples would reach even to the most distant banks of the pond. This will, perhaps, elucidate to some extent the *modus operandi* at the transmitting end. Turning now to what goes on at the station connected for receiving, we find the same aerial conductor, but with its foot now connected to the "coherer," whose invention by Branly, and development by Marconi and others, has constituted such an essential part of practical space telegraphy. Writing in the summer of 1891, Professor Branly described his first experiments as follows: "Let us take a circuit comprising a single cell and galvanometer, and some powdered metal enclosed in an ebonite tube. Close the extremities of the tube with two cylindrical copper plugs pressed against the powdered metal and connected to the rest of the circuit. If the powder is sufficiently fine, even a very sensitive galvanometer does not show any evidence of a current passing. The resistance is of the order of millions of ohms, although the same metal melted or under pressure would only offer (the dimensions being the same) a resistance equal to a fraction of an ohm. There being, therefore, no current in the circuit, a Leyden jar is discharged at some little distance off, and the abrupt and permanent deflection of the galvanometer shows that an immediate and a permanent reduction of the resistance has been caused."

The coherers used to-day are constructed on this principle, many refinements having been added. Its place in the receiving station is that of the spark gap in the transmitting station, i. e., with one pole connected to the aerial (now used as a wave-catcher instead of a wave-emitter), and the other pole connected to the earth. Now, remembering that the same ether surrounds the receiving aerial and the aerial at the transmitting station, capable of feeling and transmitting the disturbance to its equilibrium caused by the sending of signals as described, and bearing in mind also that the coherer is most marvelously sensitive to the feeblest electrical jerks provided only that they be sudden, it may be understood how the faint-arriving ripple of disturbance to the electrical equilibrium of the receiving aerial, by setting up a feeble oscillatory current in it, will cause just such an electrical jerk in its coherer. The resistance of the coherer, just now exceedingly high, becomes at once reduced to a low value, allowing the battery to operate an ordinary telegraph instrument through it. An automatic device, controlled by the receiving instrument of whatever nature, serves to tap or jar the coherer immediately after it has operated, thereby restoring it to its original state of high resistance and sensitiveness to the signals. It is interesting to note that even to-day, after over thirteen years of experiment and improvement, opinions are divided as to the nature of the action of the coherer. Some authorities hold that the minute electromotive force that reaches the coherer has the effect of attracting the particles of metal into more intimate contact. There are some facts that partially bear out this theory, which, however, is not sufficient to wholly account for the extraordinary sensitiveness of the coherer. Indeed, it is probable that we shall have to wait for further researches upon the connection between matter and electricty before having the complete solution.

Such are the essentials to what may properly be called primitive space telegraphy. The scope of this article does not permit of anything like detailed description of latter-day refinements whereby the art of space telegraphy is being reduced to practice. There are, however, two problems confronting experimenters in this field to-day: Tuning, or selectivity, whereby secrecy in the transmission of wireless messages may be attained, and accidental or willful interference with them may be prevented; and the reaching of greater distances with practicable apparatus and aerials. In the course of Mr. Marconi's very earliest experiments using aerial conductors, he found that a sort of tuning could be

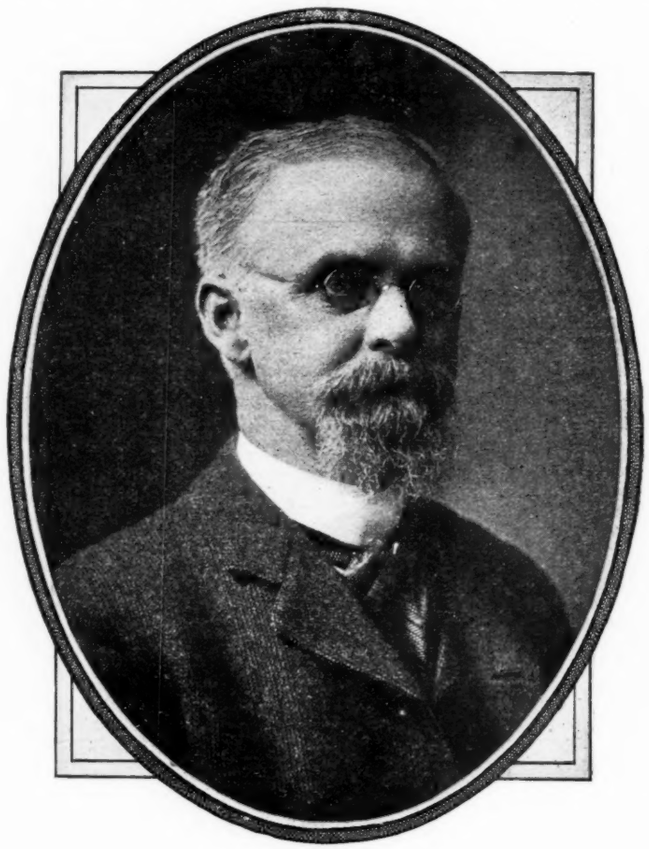
effected by making the aerials of two stations alike in length; such a pair of stations being, under favorable conditions, and with special adjustment, in tune with each other to the extent that they were in very sensitive communication with each other while not being readily interfered with, or reachable by, other stations. The modern criterion is, however, a much more definite and difficult matter. This was shown recently in the deliberate interference with a lecture on wireless telegraphy, delivered by Prof. Fleming in London; a message from the Marconi Cornwall station, fifty miles distant, being broken up and interfered with by a Mr. Maskelyne, who tried successfully to "tap the wire" from a special station in London. Malicious interference with the wireless reports of this year's International yacht races is another instance in point. The subject is being worked upon with energy and persistence by several talented scientific investigators, including Mr. Marconi. The laws underlying the possibility of attaining tuning by what is called "electric resonance" are well understood; but the operation of these laws for oscillatory currents of such enormously high frequencies as are used in space telegraphy, brings in use so many special phenomena in a new field that final success is still to come. The most promising methods that have come to light in the technical press show due appreciation of these special phenomena and well-conceived efforts to turn them to advantage. Thus, the pseudo tuning already referred to as having been attained some time ago by Mr. Marconi, depended upon the natural rate of electrical oscillation in his aerials themselves; the associated apparatus being connected directly to them. In more recent attempts to produce wireless systems that must meet the most rigid standard of secrecy and inviolability, the aerials are made stricely subordinate to artificial electrical constants, under better control, whereby the rate of oscillations is "forced" and capable of definite adjustment. Further than this, it is sought to make use in the signaling of two or more separate and distinct frequencies of oscillation impressed upon the sending aerial at the same time; the receiving station being similarly tuned in double, so to speak, and the arrangement being designed as a sort of "combination lock" device, rendering that particular pair of stations immune from malicious interference, however powerful it might be.

The matter of signalling through great distances is one depending largely upon the achievement of successful tuning, for it is found that with practical tuning comes a certain penetrative power of the oscillations, to affect the distant receiving station. Increased sensitiveness of receiving devices is another field of research. In addition to coherers based on the Branly principle, there are now in use several wholly distinct devices for which special claims are made. It is possible that the whole matter of reaching distance has been made more of a difficulty than it ought. Mr. Marconi's report of his success in signalling across the Atlantic, prematurely announced as it undoubtedly was, has given the matter of reaching great distances not only undue importance at this stage of the development of wireless communication, but also a kind of set-back in the minds of many. "Wireless" has its own field, namely: communication over sea, and that field will not be very seriously limited if it is found that we cannot signal half way round the earth, with commercial certainty, within the next five or six years.

Those who speculate on the probable abandonment of cables, in what seems to them a warfare between the old and the new telegraphy, forget that in matters of transportation and communication a new method rarely supplants an old one. The new method brings in new business of its own and that is all. Elevated trains always seem actually to make more business for surface cars, and the extension of the telephone has certainly not seriously curtailed telegraph receipts. Cables, then, will continue to be used, and new cables will be laid; and wireless telegraphy will go on developing and extending its own field.

PROMINENT EXCHANGE MANAGERS

R. F. Johnson, secretary and general manager of the Valley Telephone Company, Saginaw, Bay City and Flint, Michigan, is a pioneer in Independent telephony, and one of its bulwarks in Michigan. He was born in Connecticut in 1848 and went to Michigan at the age of twenty. For twenty-five years Mr. Johnson held positions of trust in the log and lumber industry. For three years he was city clerk of Saginaw. He began with the Valley Telephone Company December 1, 1897, and his ability was immediately shown. The company under his management, assisted by H. A. Price,



R. F. JOHNSON.

the company's superintendent and electrician, has during the past season expended something over $50,000 in extensions, all of which money was provided for by the sale of stock out of the treasury at par. The company this season has taken care of the rural country east of Saginaw and Bay City which is tributary to Saginaw and Bay City as commercial centers, and upon the first of January next the company feels as though it will be able to take care of the towns of Saginaw, Bay City and Flint, and all of the country towns tributary to these towns as commercial centers, with the assistance of the Union Telephone Company upon the west of Saginaw and Bay City, which has pleasant contractural relations with the Valley Telephone Company.

Mr. Johnson is a man of sterling qualities; was the first assistant secretary of the National Association, a member of the executive committee of the Michigan Association and a Michigan member of the joint traffic committee.

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MEASURED TELEPHONE SERVICE.

A Series of Articles by HAROLD D. STROUD on This Most Important Subject.

In two previous papers the writer has shown some of the possibilities of the measured rate plan of giving telephone service.

In this, and the papers to follow, it is proposed to give a general outline of some of the devices constructed to care for this class of telephone service.

Although there have been several hundred patents granted to inventors for toll registers and coin devices for telephones, there are probably not more than a dozen that have ever reached the point where they might be considered worthy of adoption, and a much less number than that, have proved at all efficient in the work for which they were designed.

In these articles, consideration for the reader will prevent dealing with the numerous obsolete schemes that have been proposed, to which the patent records bear witness, except to show the different functions employed to obtain the desired object. I will not attempt to say that these so-called obsolete schemes were not necessary steps in the evolution of practical devices, however, for they were.

Among the list to which I refer, there are schemes for causing almost every part of the telephone in its functions to be incomplete until a coin would be deposited, or some other act of the subscriber was performed whereby a charge was registered, or a toll collected, for the call made. In the present article only the coin, or token, devices will be described.

The use of devices for measuring telephone traffic were given serious consideration almost as early as the switchboard, and it is probable had there been practical devices in the early days of exchange practice for measuring telephone traffic, or recording the same, that the measured rate might be the only basis upon which telephone service would now be given. As is illustrated in the case of electric light and power work, until a reasonably accurate meter was devised, all service was given at a fixed price, based on the number of lights, or on some flat rate scheme. But the advent of a meter caused a revolution in these methods.

The planning of a meter for measuring the continuous flow of electric current, and the producing of a metering device, or more properly a counter that will check only calls which originate from the particular instrument to which it is connected, are undertakings of an entirely different nature.

There are three principal distinct plans upon which such devices operate, which I will classify under the different headings of "Prepayment Toll Devices," "Request Toll Devices," and "Switch Lever and Generator Crank Locks."

Prepayment toll devices attracted the inventors and was the earliest scheme tried, and is undoubtedly the proper principle for measured service work. By this plan the party wishing to give a call must perform whatever act is required of him to pay for the call before the switchboard operator, who is to complete the connection, is required to give her attention to that call, or be in any way engaged by the calling party.

This is a very important feature in operating telephone collections and meters. The operator should not be burdened with more work than can be avoided, even though the using of these devices materially lightens her duties. Such devices permit her to care for a greater number of lines without increasing her work.

Every practical means is now being resorted to in designing telephone apparatus to give the operator as little as possible to do in handling each connection, and it will thus be seen that if a coin must be deposited to pay for a toll previous to taking up the time of the operator, the call signal can be made to serve the additional function of indicating the deposit of a toll fee in the shape of a coin or token.

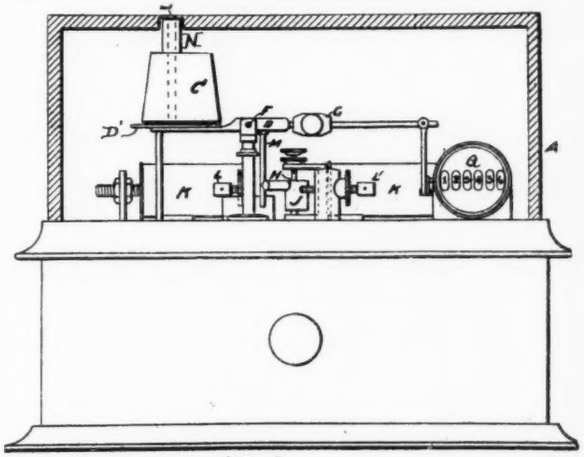


FIG. 1.

Figs. 1 and 2 show one of the earliest machines for collecting coin for telephone toll, and is as well a counter, or register.

Referring to Fig. 1, *A* is the case divided into two portions, the upper part containing the mechanism, and the lower part provided for the coin. The coin is introduced into the slit *b* by the user when he desires to make a call. The coin drops on the tray *D*, the guard *c* serving to guide it into place. The weight of the coin changes the electrical connections of the line so as to excite a signal in the cen-

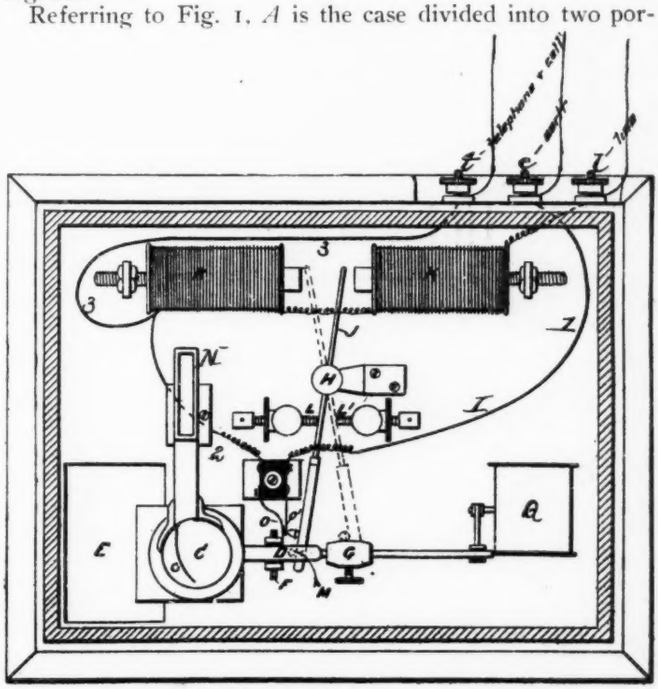


FIG. 2.

tral office, the circuits being so arranged that a signal cannot be given without first depositing a coin or its equivalent. The weight of the coin closes a pair of contacts, and causes the excitement of the polarized relay *KK*, and by virtue of the polarity, the armature is drawn into a position as shown, and maintained there until the operator answers. When she has given the service desired, she impresses a current or a different polarity upon the line, and causes the armature to attract to the other pole of the magnet, *KK*. This allows the tray upon which the coin rests to tilt to such an angel as to allow the coin to drop into the lower part of the box, at the same time operating a counter—*a*—and registering the call.

This invention was made about twenty years ago by three

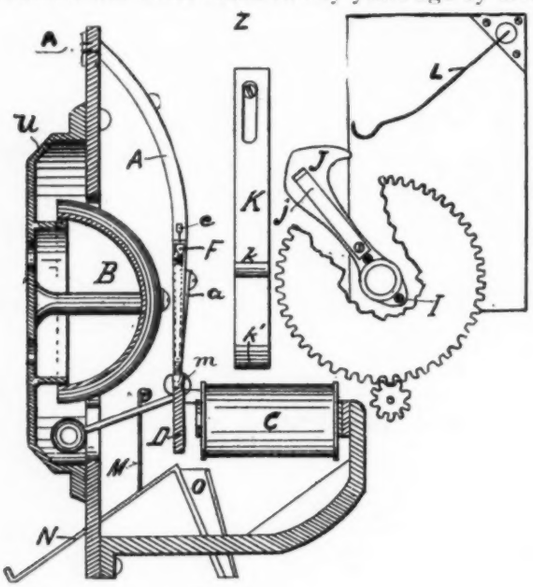


FIG. 3.

Englishmen, Crossley, Emmott and Harrison, and shows how early in the business serious effort was given to this class of apparatus.

Fig. 3 shows another early scheme in which *C* represents the signal bell magnet; *B* the gong; *O* the cash box chute; *N* a refund chute; *A* the opening slot where the coin is inserted by the user; *F* is the contact which the coin causes to be opened as it comes to rest. This contact serves to normally short-circuit the calling generator. When a telephone call is to be made, the user must deposit a coin, which opens the generator shunt and allows the current to pass out over the line and give the central office the signal. The generator is operated by the act of removing the receiver. The act of replacing the receiver causes the coin to be cashed, but if the connection called for cannot be made, the opertaor rings back on the line and returns the coin to the tray *N*, where the user can recover it. The armature *D* is hollow, so that the coin passes through it. From this point its direction is determined by the position of the armature in the operator's control.

The reason for having the switch or receiver support operate the generator was obviously to arrange so the party must hang up the receiver, thus cashing the coin, in order to signal for a disconnect, as the operator would remove the plug, and in order to get another call the party must deposit another coin. Otherwise, if the generator was turned by an independent crank, the party could signal for a disconnect, and then, before hanging up to release the coin and break the shunt circuit about the generator, he could make more calls on the same coin.

This scheme theoretically was very ingenious, but the limited motion of the generator permissable in the method shown was, no doubt, its principal weak point.

Another device that employs the switch lever to perform a function is shown in Fig. 4. In this scheme, instead of breaking a shunt circuit about the generator by the use of a coin, the generator circuit is normally left open.

Figs. 3 and 4 are intended to represent the interior construction of the toll device, the various parts being lettered alike on each figure. *A* is a flat tube, the internal diameter of which is designed to allow the ready passage through it of a coin or token admitted by the escutcheon *B*. The tube *A* and escutcheon *B* are held in place by the bolts and nuts *H*, the various sizes of escutcheons being interchangeable. Therefore, a box can be operated by any desired coin, by substituting one escutcheon for another, and readjusting the stationary electrode as explained below.

C is a back-stop which operates through the apertures *F*, and whose function it is to prevent the toll-taking device from being operated in an illegitimate manner.

D is a normally stationary contact point, but which admits of adjustment to suit different sizes of coins or tokens. *E* is a movable contact or electrode mechanically attached to, but electrically insulated from, the hook *G* in such a manner that when the hook is depressed by the weight of the receiver, as represented in Fig. 3, it will, in conjunction with stationary contact *D*, arrest the coin on its way into the till and hold it suspended against and, of course, in electrical contact with both electrodes. As soon, however, as the receiver is removed from the hook and the hook is raised, by its retractile spring, into the position shown in No. 4, the space between the two electrodes *D* and *E* is increased sufficiently to allow the coin to escape and fall into the till.

This device, unlike the one previously mentioned, does not give the calling party back his money if the line called for is busy, or if, for other reasons, satisfaction cannot be given for the money deposited. In operating such a device, the company would have to give a rebate or credit for the unsuccessful calls. In any device of this class, where the switch lever is employed mechanically to perform a function in the controlling of the coin, the coin box must necessarily

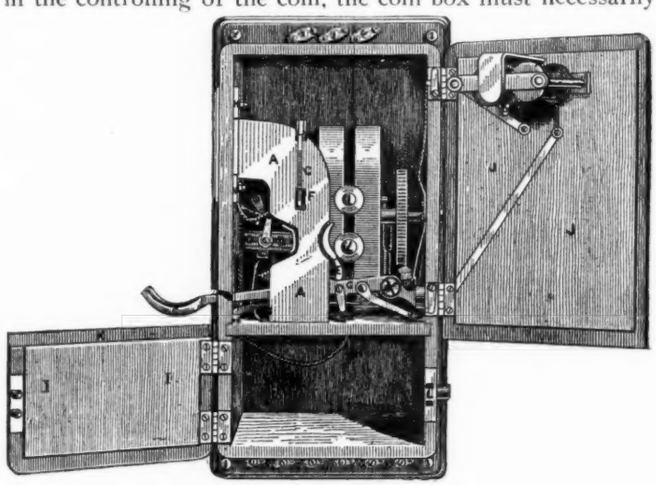


FIG. 4.

be an inseparable part of the telephone. That is, the telephone must be built to provide for such a device.

The device shown in Fig. 5 is another effort towards producing a machine with the automatic calling and refund features combined. This scheme employs about the same arrangement for signaling central as does the one shown in Fig. 4. The magnet *34* serves to direct the coin either back to the subscriber or to the cash box. In order to direct it towards the cash box, the operator rings back on the line and releases the coin, by this means cashing it. If the service desired cannot be given, then the act of hanging up the receiver causes the money to return to the cup *47*.

Briefly reviewing the operation of the device and assuming that a call is to be made from a station equipped therewith, the coin is first dropped into the chute to establish the ringing circuit of the generator, when the bell is rung and the receiver lifted from the hook in the customary manner. The talking circuits of the telephone are then automatically switched into the circuit of the main line by the spring-actuating switch lever *5*, and the lid *14* actuated therefrom to release the coin by retracting the studs *17* and *18*, when the coin is permitted to drop to the lower end of the chute, cutting out the ringing circuit and closing the shunt circuit through the electro-magnet *34*. The subscriber then informs the operator at the central office of the connection desired, the character of the transmitted sound indicating the presence of the coin. The central operator when ready to make the desired connection first momentarily actuates

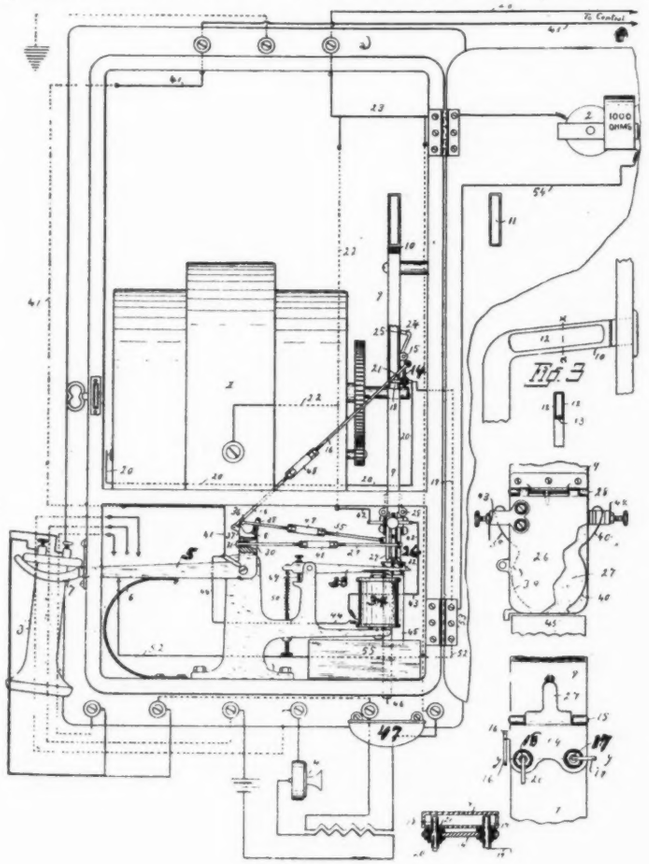


FIG. 5.

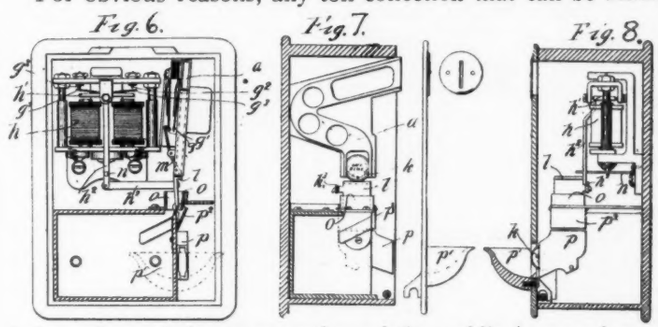
the switchboard ringing key, and thereby energizes the electromagnet *34* to depress the armature *33*, when the spring-actuated plate *26* swings outwardly and discharges the coin into the till. The connection desired by the subscriber is then made. If the desired connection cannot be made, the central operator does not operate the ringing-key, and the coin is therefore not discharged into the till. The subscriber may then depress the lever *5* either by returning the receiver in the hook or otherwise, when the plate *27* is actuated to discharge the coin through the chute *46* into the cup *47*, where the party making the call may recover it.

The device shown in Figs. 6, 7 and 8 is one of this class first used in Chicago and was the invention of Mr. A. M. Bullard and Jos. J. O'Connell.

Devices of the class to which this one belongs have two particular functions, that of dropping the coin into the cash box after it has been earned by the company, or returning it to the depositor by releasing it to drop into a cup, where he can pick it up.

Before the advent of this machine, the operator had control of only one of these functions, either to cash the coin or return it. To perform the other function, the co-operation of the subscriber must be had either by the act of pressing a button, working a switch lever at a given moment, or by a combination of these acts, and assisting in various other ways to produce the desired result.

For obvious reasons, any toll collection that can be made



independent of the co-operation of the public is superior to one that is so dependent and the less complex such a device can be made the better.

To perform the functions stated in the device shown in Figs. 6, 7 and 8, a polarized magnet is used to tilt a con-

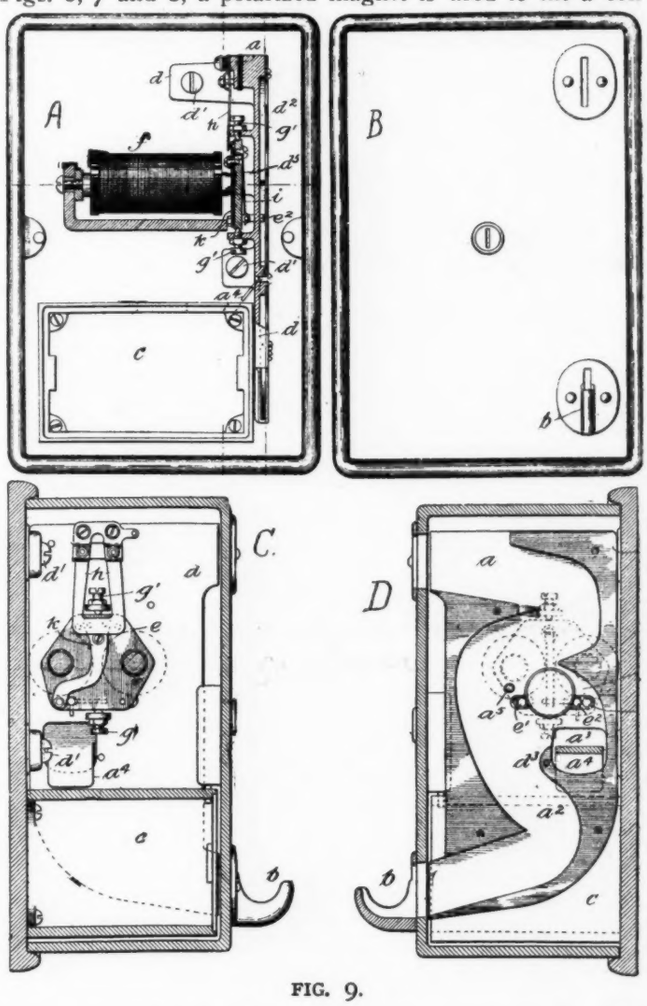


FIG. 9.

trolling lever to one side or the other, in response to either given polarity of current sent out over the line from the central office. The operation of this machine is briefly as follows:

If a coin is dropped in the apparatus *a*, Fig. 6, it is guided down to the rest *i*, at the same time closing the contacts *g'g'*. The closing of these contacts connects the magnet *h*

in a ground bridge from the line communicating direct with the signal relay at the exchange, energizing said relay and announcing the call to the operator who is to answer it.

In operating this device, the operator upon desiring to control the coin, presses a button, upon which is indicated the direction its action will send the coin. Upon pressing either of the buttons, which are marked or understood by the operator to be for the purpose of returning, or depositing, if a special pilot lamp lights at the first pressure of the button, the operator repeats, then if the lamp does not light, she understands that the coin has been released, presumably in the direction intended.

Fig. 9 is, in principle, the same device as is shown in the previous figures, but greatly improved in mechanical design and construction. It was designed by Mr. Scribner

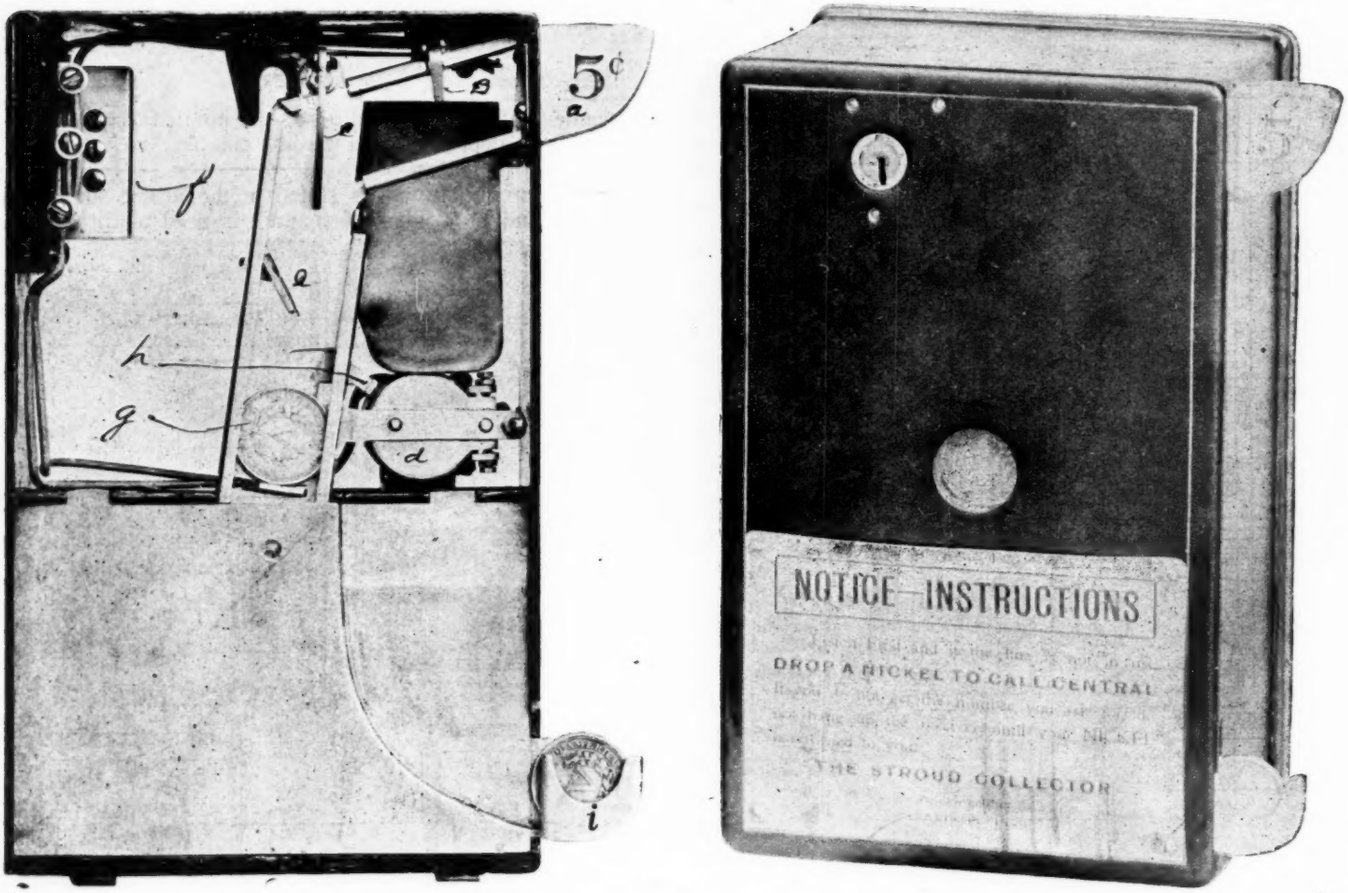


FIG. 10.

of the Western Electric Company and used by the American Bell Company's licensees to handle the nickel service.

In Fig. 9, *A* shows the device with its cover removed; *B* shows the outside with the receiving and returning receptacles; *C* and *D* the chute and the contact arrangement.

Fig. 10 shows two views of a device designed by the writer, who claims some material improvements over the last machines described. In all the devices thus far described, one or both functions were in the control of the operator. In those where but one function was in her control, the other required the co-operation of the subscriber in some way. In this machine the operator is always in control of the returning function, the other being automatically cared for by the deposit of the succeeding coin. Neither the subscriber nor the operator have any work to do in the cashing of the money.

Fig. 10 shows the interior of the device. The coin receiver *a* is marked "5 cents," but by a slight change can be made to receive other sized coins. If a coin of the proper size is deposited, it rolls down the chute, passing the penny and dime ejector *b* and the dog *c*, striking the angle *e*, which causes a lever on the back of the chute to move out of the path of the coin, at the same time moving into its path the projection *h*, which is mounted on the same lever. Thus, when the coin has struck the angle *e*, it moves the lever and drops the projection *h* at such an angle that the lever is moved back into its normal position. The coin then finds a rest on a seat formed by the extremity of the same lever to which *e* and *h* are attached. When the coin strikes *e*, all the projections move with the movement of the lever. It therefore is evident that if a second coin be dropped, the movement of the lever will unseat the coin resting at the base *g* and cause it to be dropped into the cash box below, thus performing auto-mechanically one of the functions.

It will be noticed that by virtue of this plan, the last coin deposited remains at the base *g* until another call is made to cash it. Advantage is taken of this fact, and by cutting a hole in the front cover, and therein inserting a glass, the last coin can be exposed to public view as a guard against the dishonest practice of using bogus coins or slugs.

The magnet *d* controls a side outlet from the chute, so that if it is desired to return the coin to the depositor, the operator presses a key and causes the armature of magnet *d* to attract, allowing the coin to drop into the position *i*, where the depositor may regain it.

Should a penny, dime or any undersized coin, slug or paper be deposited, it would strike the ejector *b* and be sent directly back to the depositor, dropping into the same cup to which the proper coin would be returned by the operator. The dog *c* is to prevent a coin attached to a string or wire from being withdrawn after the operating lever has been struck at *e* and the signaling contacts closed. *f* is a small relay which controls the signal after being closed by

the coin contact. The same device, by a change of the connections, may be made to operate as a buzzer on a plan which will be described later under another class of devices.

The mechanism of the device illustrated in Fig. 10 is enclosed in a pressed steel case. The lower portion of this is reserved for the deposited coins and is provided with a separate door and spring lock. Its capacity is about fifteen dollars in nickels. The outer cover has a separate spring lock with a different key. In practical operation, the collection department of the large companies would have both the key to the inner and the outer cover, while the repair men would have only the key to the outer cover, so that they would not come in contact with the cash.

The foregoing illustrates the principal progress in the class of devices operated under the plan where the toll is prepaid.

The second plan of operating toll collectors, to which former reference has been made, is to get the attention of the central office in the regular manner either by turning a generator or by simply removing the receiver. Then, at the request of the operator, the coin is deposited by the party making the call, and either an aural or a visual signal serves to indicate the fact to the operator. The

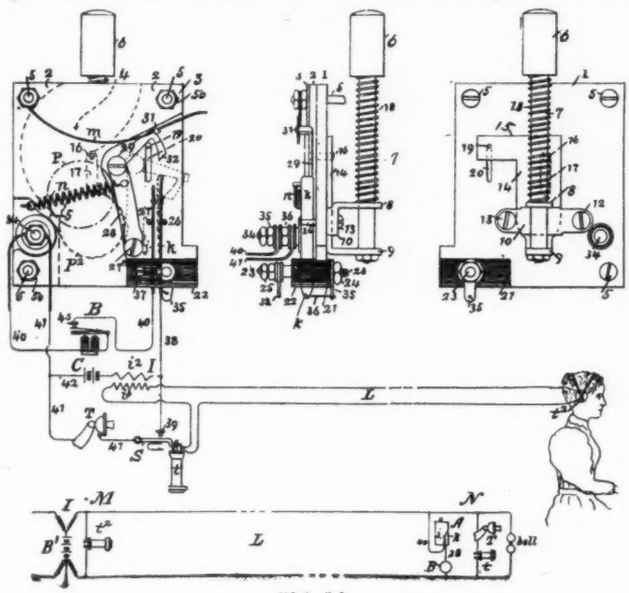


FIG. 11.

serious objection to this plan is the drag on the operating due to the fact that after answering the subscriber and taking his order, the operator must get the party called for, and then come back to the calling party for the toll. This takes more of the operator's time than can be afforded in a very busy system.

For a limited number of toll terminals, where it is desirable for the operator to collect coins of various denominations, the comparatively small number of the devices required would not work to a great disadvantage in the service, although for this class of work if a device could be made that would be practical, it would be superior to the devices operated on the request plan. Some attempts have been made to devise such a machine, but nothing notable has been accomplished in this direction to the writer's knowledge.

In the device coming under the class which I am now describing, the aural signal is transmitted over the line from the sub-station to the operator at the exchange by dropping a coin or by first dropping a coin and then pulling a lever or pushing a button to force the coin past a contact or lever to cause the signal to be given, the coin usually acting as a mechanical connection between the button, or lever, and the signal giving element of the device.

Fig. 11 shows a machine designed by Mr. Geo. K. Thompson and used by the Bell companies for a number of years. The means for signaling in this device is to cause an interruption of the battery through the induction coil or repeating coils, to produce the buzzing sound at the time the coin is inserted. In local battery work, the buzzer is connected across the terminals of the transmitter through a normally opened pair of contacts to be closed by inserting a coin. The buzzer being of much lower resistance than the transmitter, gets enough current to set its armature in motion,

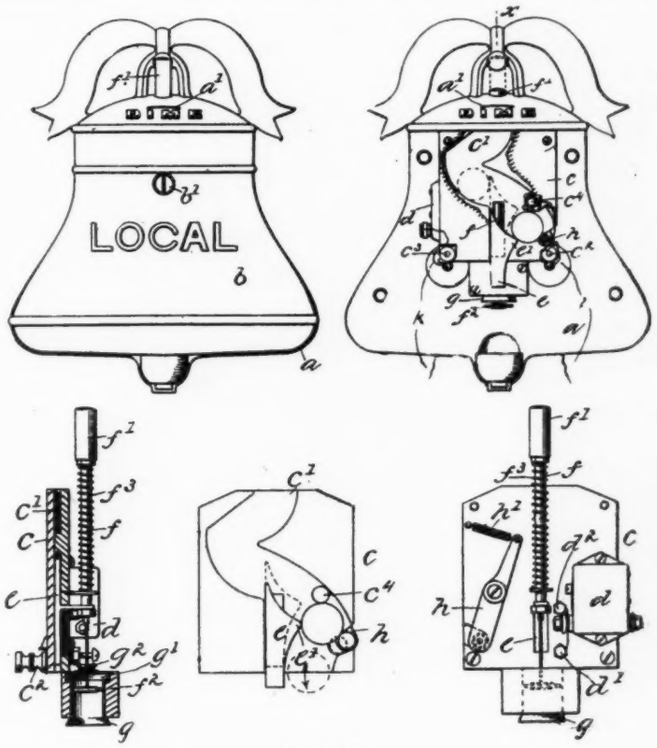


FIG. 12.

thus causing a tone to be set up which the operator recognizes as a signal that the coin has been deposited. The mechanical arrangement in this device is plainly shown in Fig. 11 by the various views.

The circuit shown at the bottom represents the manner of connecting the same machine on a common battery circuit.

Another device very similar to this was designed by Mr. Grey of Hartford, Connecticut. These were also used by the Bell companies to a large extent. The encasement resembled a bell and the devices were commonly termed "Blue Bells," on account of the color of their finish. The operation of this machine is as follows:

The telephone having been used to call the central station in the ordinary manner, and it being found that the desired connections can be had, the user of the device is directed to drop a coin into the coin slot a' at the mouth of the coin channel c'. The coin falls to the position shown in dotted outline in one of the drawings. The plunger is then pressed down to its full extent, when the coin rolls over the top of the ward e into the position shown in full lines in one of the drawings, said coin in this position resting against the follower h and the nose e' on the ward e. As the pressure upon the plunger is released the ward e travels slowly backward, pushing the coin against the conductor c^4 (as shown in the drawing), the follower h insuring the engagement of the coin with the nose e' on the ward and the conductor. The electrical circuit is completed by the coin in this position, the current passing through the wire i to the binding post c^2, thence to the conductor c^4, thence

through the coin to the ward e and to the conductors d' and d^2 (one or both), thence through the buzzer to the binding post c^3 and out through the wire k to the battery. When the pressure is relieved from the plunger, the latter moves slowly upward, owing to the compression of the air within the dash-pot, and this insures the sounding of the signal for a sufficient length of time to certainly notify the operative at the central office that the required toll for the use of the device has been paid. As the ward travels backward under the impulse of the spring f^3 the coin is forced into contact with the conductor c^4, that prevents its further movement backward along the channel. The upward movement of the ward forces the coin to one side against the push of the follower h until the nose e' has passed upward beyond the coin, when the latter falls out of the end of the coin channel into its receptacle.

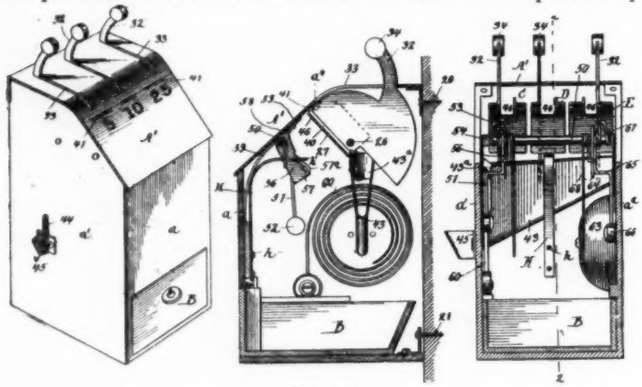


FIG. 13.

The machine illustrated by Figure 10 is designed to be operated on the request plan, using the buzzer as a signal; but if it was desired to collect for a toll connection amounting to twenty-five cents, five nickels could be deposited, each giving a distinct signal. For regular local work, the use of this machine, operated in this manner, does not retard the operating greatly from the fact that the operator can request the toll as soon as she has answered. If she does not complete the connection, she may return the party his coin, and she is not required to follow up to see if the party calling gets the party asked for, although it is desirable for the operator to test before asking for the toll, as this way leaves her less nickels to return.

The devices thus far mentioned are provided for receiving coins of one size or denomination. There has, however, been a large field for a device to receive coins of various denominations, so that the operator can collect toll for long distance conversations. The Grey Pay Station Company of Hartford, Connecticut, some years ago built a machine for this service that received coins of all denominations up to $1.00, with the possible exception of a penny. The coin signals were made by the coin striking bells of various tones or sizes, the sound being conveyed to the transmitter through a hollow tube. This machine was large and cumbersome and could not be attached to all telephones for that reason.

Fig. 13 represents a device to do the work of the early Grey machine, the advantage of this one being its compactness. This machine is made by the Baird Manufacturing Company.

Referring to the drawings shown in Fig. 13, it will be seen that if a proper sized coin is dropped in any of the three slots, it lodges in a way to form a mechanical connection between the lever corresponding to that slot and a hammer or striker, which, upon the movement of the corresponding lever, is caused to strike a gong or spring to produce the audible signal which is to be heard by the operator. Each slot has a sounder of a different character, and by mounting the whole device very close to the transmitter, the mechanical vibrations are reproduced so that the operator can recognize them.

As in the case of the Grey machine, the operators sometimes mistake the signal of one coin for that of another by failing to recognize the tone and associating it properly. The loss which the company might sustain from this source is trivial compared with the inconvenience to themselves and to the public by the old methods of collecting toll, or not collecting it, as often happens.

A TYPICAL GROUP OF INDEPENDENT TELEPHONE CONSTRUCTION MEN.

Testing and Selecting Raw Material.

By H. M. DEAVITT.

By far the most costly of the textile materials in common use in the telephone is silk. Though many grades and varieties are obtainable, the high price is a feature common to all. But because of its great durability, exceeding softness and beauty, and the ease with which it can be adapted to many different purposes, it is an article with which it would be difficult to dispense.

To study the history of the silk-growing industry would necessitate going back to the early days of the Chinese empire, in which country it has ever continued to be an occupation of exceeding importance. By the Chinese, the discovery of the method of producing silk is accredited to Si-ting-chi, the wife of the Emperor Hoang-ti, and through gratitude for this great benefit she has been deified under the name of "Goddess of Silk Worms." The silk industry steadily advanced and much of the material was exported, but the secret of its production was most jealously guarded, so that while Europe imported a large quantity of the product, no attempt at silk culture could be made on that continent until the fifth century A. D. At this time silk worm eggs were brought into Italy, which country since then has grown to be an important silk-growing center.

Silk is the material with which the silk worm surrounds itself when it enters into the condition known as the "pupal stage," that is, the time of existence intermediate between its worm or caterpillar stage and its adult or moth form. The case in which the pupa is formed is termed its cocoon, and is composed of an outer, loose layer, and a firmer, inner one. The color varies from white to deep yellow, though red, brown and blue silks are sometimes found. The color depends largely on the variety of worm, the quantity and quality of its food and the locality in which it was grown, though it is not uncommon to find different shades of silk produced by worms of the same species, reared at the same time.

The silk worm is by nature a delicate creature, and has become more so from the artificial mode of existence to which it has been subjected. To raise silk, therefore, requires extreme care as to food, cleanliness, temperature, etc. The food of the silk worm consists of the leaves of the white mulberry tree, and although leaves of the osage orange have been used with some success, the worms thrive better on the former. The worm has an enormous and continuous appetite, which can be readily understood when we consider that in the time between its emergence from the egg and the end of its month of existence in the caterpillar form it increases in weight about 9,000 fold. During this time the worms shed their skin four or five times, the periods at which this occurs being known as the "sicknesses" of the worm. After each "sickness" the number of possible silk producers is diminished, the weak and unhealthy worms being unable to withstand the ordeal.

There are a number of varieties of silk worms; the preceding remarks applying chiefly to the common kind known as bombyx mori. Other worms are antherea mylitta, antherea yamamaya, bombyx cynthia, bombyx faidherbi and many more. Of the above, antherea mylitta stands next in importance to bombyx mori. From this worm is obtained the so-called tussah or "wild silk," which is largely used in electrical manufacture, supplanting the more expensive bombyx silk.

Silk is contained in the body of the silk worm in the form of a sticky liquid, and is secreted from glands each of which has a small opening, near the head of the worm, through which the thread is spun.

The number of these openings vary, Bombyx mori having two, while the tussah worm has a larger and inconstant number. As the fibers leave the orifices of the glands, they are covered with a thin coating of a substance known as silk gum, which binds them together into a strong filament. The filament is of considerable length, that forming the coccoons of bombyx mori averaging about 1,500 yards. The silk produced by the different varieties of worms varies in diameter, but the thread from any one cocoon is not uniform throughout, diminishing in size from the beginning to the end of the filament. This fact must be taken into account by the silk manufacturer in order to produce a yarn of uniform size and strength.

After the worms have completed the spinning of the cocoons, a number of the best are selected for breeding purposes and the rest are killed, either by dry heat or by steaming. They are then subjected to the process of reeling. Pierced cocoons, that is those from which the moth has issued and which consequently have been broken through at the end are not reeled, but are saved and made up into yarn by processes similar to those employed in cotton manufacturing. The outer loose layer of the perfect cocoons is stripped off to be used with the silk from damaged cocoons, in the manufacture of cheap grades of spun silk. The cocoons are then thrown into a basin of warm water which softens the gum, allowing the silk to be reeled into skeins. The ends from a number of cocoons are reeled together in order to produce a strand capable of resisting the various subsequent operations. The number of threads taken determines the counts of the finished thread, and as before indicated, if the manufacturer is not careful regarding the variations in diameter of the silk fiber the resulting thread will be uneven. When silk so reeled is used on the common form of insulating machines, it will, of course, produce an irregular covering with a variable resistance.

After being put into skeins the silk is known as raw silk, and in this condition large quantities reach this country, where many large and well-equipped establishments exist for completing the processes of manufacture.

Arrived at the silk mill the material is subjected to several operations, varying with the use to which it is to be put and with the quality desired for the finished product. Most of it first undergoes scouring or "boiling off." This consists in boiling the silk with a large quantity of one per cent or two per cent soap solution, and has for its object the removal of gum and the consequent separation of the fibers.

The extent to which this is done is indicated by the names given to the various qualities of silk, "pine boiled off," losing all but from five to fifteen per cent of its gum, "souple" silk, losing only five to eight per cent, and "ecru" silk, from two to five per cent. Silk which has not been properly scoured has but little luster and often possesses a disagreeable odor. As the gum may constitute a quarter of the total weight of the material supposed to be all silk, it is advisable to have tests made of the same before accepting it.

The processes of manufacturing yarn from unbroken cocoons are known as "throwing" in contradistinction to the "spinning" processes to which short fibers are subjected. Of thrown yarns we have "tram," which is soft, having a loose twist, and organzine, which is twisted somewhat more strongly and is therefore harsher and more able to with-

stand rough usage. In weaving, "tram" is used for weft silk, while organzine constitutes the warp.

Among the spun silks we have those from which the gum has been more or less completely removed and the variety known as "chappe" silk which retains all the original gum. Under the microscope chappe silk may be known from the fact that the ultimate fibers are still enclosed in their gelatin sheath. Thrown silk from bombyx mori (Fig. 1) appears like a homogeneous glass rod, sometimes presenting faint longitudinal striations. Fig. 2 is from a photomicrograph of tussah silk and always has well marked striations. The fiber of this latter silk is sometimes twisted, for which reason it may by the inexperienced observer be mistaken for cotton.

Chemically considered, raw silk is a complex substance composed of compounds of carbon, hydrogen, nitrogen and oxygen. The principal constituent is fibroin, of which about sixty-five per cent is present. Sericin, or the silk gum, is found in quantities varying from twenty-two to twenty-five per cent, and mineral matter to the extent of one or two per cent. The remainder is moisture. Conditioning houses have been establishd in many silk manufacturing centers to determine the percentage of gum and moisture present. Silk is capable of absorbing up to twenty-five per cent of moisture, without feeling damp, the only indication of its presence being an increase in weight.

Mineral acids when concentrated attack silk quite readily, while alkalies have little effect. Acids are very often found in silk having been added in a dilute form to give that peculiar crackling sound known as the "scroop." It is important to take this fact into consideration when buying silk, inasmuch as some of the acids used for this purpose are especially undesirable, the silk fiber retaining them most tenaciously while the water with which they were diluted is allowed to evaporate. This increases the concentration of the acid, when as above indicated, the fiber is readily attacked, losing all qualities which make it valuable for any purpose requiring a material possessing strength and elasticity. Other acids have not such great affinity for silk and therefore gradually evaporate. For common purposes such material might be perfectly satisfactory, but yarn of such kind would be highly objectionable for insulating purposes, because of the decrease in electrical resistance and the tendency of the acid to corrode metals.

Adulterations are propably found to a greater extent in silk than in most other materials. In fact, so extensive has this practice become of late years that the weighting or loading of silk may claim distinction as a special art. Nor is this practice to be wondered at when we consider the enormous demand for "silk" at ridiculously low prices. The manufacture of a perfect silk yarn is an operation of great delicacy, requiring much experience, and skill of the highest order. Knoking, therefore, the many things which require the attention of the silk manufacturer and his natural desire for remuneration and profit, the purchaser should be governed accordingly and not expect pure silk at a price much below the standard. Whenever a factory offers its product at a price varying appreciably from the amount asked by its competitors, it is safe to assume an inferior grade of material, or the presence of considerable adulteration. The absolute quality of the yarn is determined by taking into consideration the size, breaking strength, twist, elasticity, and the amount of foreign material present. The latter quantity includes moisture, residual gum, and added adulterations. The size of tram and similar silks is calculated on the basis of 1,000 yards to one dram, this constituting what is known as a "1-dram silk." A "2-dram silk" is one of which 1,000 yards weighs dram, the other numbers being similarly derived. Chappe and other spun silks are numbered similarly to cotton. The breaking strength is affected to a large extent by the care given the worms and the method of conducting the boiling off. The twist is an item of importance in considering the value of yarn for insulating fine wire, a loose twist being preferable to a tighter one as it permits of a more even covering.

A test of elasticity is a valuable supplement to the strength test, yarn showing poor results in this direction being unfit for any but indifferent work. The presence of moisture in silk is a subject regarding which every prudent buyer will inform himself. It is certainly not very desirable to pay for water at the price of silk. It is determined by drying the silk in specially constructed bottles in which the material is subjected to a temperature of 110 degrees C., until it is

FIG. 1. SILK FROM BOMBYX MORI MAGNIFIED 225 DIAMETERS.

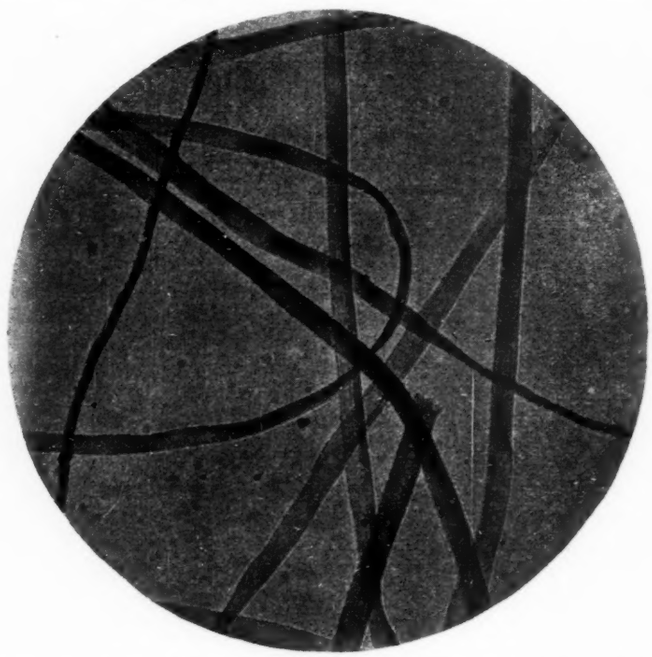


FIG. 2. SILK FROM ANTHEREA MYLITTA MAGNIFIED 225 DIAMETERS.

of constant weight. The amount lost represents the moisture present. The normal amount of moisture in silk averages eleven per cent.

It is quite customary for manufacturers to leave considerable gum in their yarn and offer it at a slightly reduced price. Such material is usable for some purposes, but cannot withstand high speed and tension as well as pure material. In any case where such silk is purchased, a test is desirable in order to see that sufficient allowance in price has been made to compensate for the inferior grade. An attempt to enumerate the materials used in loading silk would require a list of all material which can be made to adhere to the fiber. While black silk is capable of the greatest adulteration, the color is no guarantee of the absence of foreign material. A perfectly white silk may contain as high as fifty per cent of other substances without much change in appearance. Sodium silicate, waxes of various kinds, and even sugar and common salt are very commonly found on white silk, while salts of many other metals including iron chromium, zinc, etc., are found on the colored yarns. Tarmin in its various forms is also largely used. It is not necessary to point out to the manufacturer of insulated wire the undesirability of having these substances on his yarn. The resistance is in almost all cases greatly reduced and the working qualities of the silk affected. Many of the weighting materials are so skillfully added that considerable experience is necessary for their detection.

Though many substitutes for silk have at different times been brought forward, their employment for any but indifferent purposes has not made much progress. Among the most common of these materials are the numerous "lustro celluloses" produced by the action of acid on cotton, wood and other vegetable substances. The silken fibers of pinna, a variety of mussel, are used to some extent in the countries of Southern Europe, while attempts to procure silk from spiders have been made many times. As a desirable and comparatively inexpensive form of silk for use in the electrical industry, the writer would recommend for consideration chappe silk. While this cannot be manufactured into as fine threads as tram, and is therefore excluded from use in the industry of creating very fine numbers of wire, it should prove valuable in covering the coarser numbers.

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The Economic Management of Modern Telephone Exchanges

Carl C. Curtis, A. M. A. I. E. E.

THE MAINTENANCE DEPARTMENT.

Next in direct importance to the traffic in the relations of the exchange to the public, comes the maintenance department, and second only to the operating, has its management and development suffered neglect. Progress along the lines of the speedy, efficient and systematic clearing and recording of trouble has for some reason been greatly retarded to the detriment of the service as a whole. In so many offices the proper standing and duties of a wire chief are wholly unknown, and the linemen are permitted to test out their own trouble to say nothing of allowing them to dig into the switchboard with eight-inch pliers and twelve-inch screw drivers. It is exceedingly difficult to handle trouble and construction work under the same department or the same authority, even in small exchanges. It pays to keep the construction and maintenance entirely separate in order to insure to each thorough supervision. Trouble men and construction linemen require different training to produce good results and the details of their work are essentially dissimilar.

THE TERMINAL ROOM—LOCATION.

As regards the remainder of the exchange the terminal room, like the operating room, should be isolated. It must be convenient to the power and battery rooms as well as the operating room, and like the latter must be kept free from noise, dust, dirt and dampness. What has already been said about heating and ventilating the operating room applies with equal force to the terminal room.

The best floor for the terminal room is made of small white tiles, and next to this polished quartered oak. Cement is dirty, dusty, dingy and hard to clean, and unless it is well laid it cracks and crumbles badly. Tile possesses excellent insulating properties; is practically fire-proof, and is easily kept clean and sweet. Where circumstances render a tile floor out of the question, oak is a very satisfactory substitute, especially where the floor must be trapped for access to wires and cables underneath. There is no operation necessary in the ordinary terminal room which excuses other than imaculate neatness, nor does there exist the slightest reason for handling its furnishings with less care than the most expensive parlor furniture. What has been said of the walls and wood-work of the operating room applies here also.

APPARATUS.

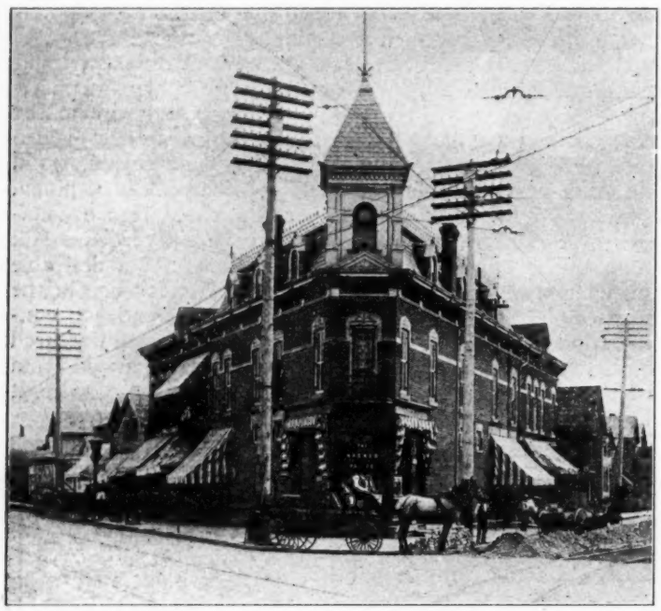
The usual and proper apparatus for this room consists of the wire chief's desk, main distributing and intermediate distributing racks, with the protectors on the main, the relay rack, and a suitable case fitted to carry a stock of extra parts, such as heat coils, fuses, relays, condensers, etc., used about the switchboard and other apparatus, and also a few tools. The power equipment and batteries have no place in this room.

In order to guarantee careful attention to apparatus the room should be kept in perfect order at all times. Men cannot do good work in a dirty, disorderly, unkempt room with the floor strewn with pieces and coils of wire, cigar stubs and paper. This condition of things evolves the labor that gives us unsoldered, poorly soldered and corroded joints and connections, to say nothing of the thick shell of dust which renders the detection of trouble underneath it a matter of speculation as to its whereabouts. It is a pity that telephone managers as a rule have such a profound ignorance of the corruptive power of dirt and unpleasant surroundings upon the minds of their employees. Its capacity for evil, direct and indirect, is unlimited and positive. A strict embargo should be placed upon the indiscriminate entrance of visitors or the employees of other departments whose duties do not require their presence.

THE POWER ROOM.

This room must be located adjacent to the terminal room, but separated therefrom in such a manner that the noise from the machines will not penetrate either the operating or terminal rooms. The room should be well lighted and ventilated, the floor finished to match the terminal room floor. The equipment usually installed here being the charging and ringing machines, power board, and tool cabinet. In laying out the apparatus, care should be taken to place the power table upon which the machines are set, sufficiently far from all walls to permit of access at all sides, as well as the removal of armatures. The placing of power machinery on benches around the walls of the room, even for small exchanges, is a mistake. Another mistake many have made is to have the power table either too high or too low to allow of working at it comfortably. To keep a

power plant in shape requires work and incessant watching, and if this duty entails unpleasant reaching or stooping, something will be neglected. It is mistaken economy to locate the power apparatus in the terminal room, as the

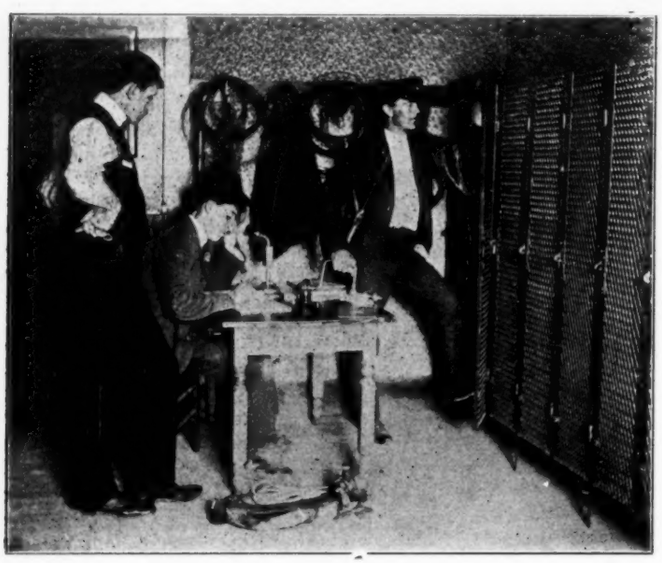


POLE LINES.

noise from the machinery is liable to interfere with the testing from the wire chief's desk.

THE BATTERY ROOM.

The storage batteries should be placed in a separate room, so ventilated that the fumes will be carried away. These fumes have a tendency to corrode and destroy connections and apparatus. An acid-proof floor of tile, asphalt, or cement is preferable to wood. The lighting should be good and the temperature kept fairly moderate. For economy in wire, the room should be situated close to the power room, more properly between the latter and the operating room.



INSPECTOR'S QUARTERS.

If the batteries are of the smaller type and arranged on an iron rack, this should be kept well painted with an acid-proof paint, and all precautions taken to prevent the iron rust from falling into the jars.

INSPECTOR'S QUARTERS.

Inspectors and troublemen awaiting assignment on cases must not be permitted to congregate in the terminal or any other room except the one designed for that purpose. Such a room is best located off the terminal room, in order that the wire chief can at all times have a view of it. The furnishings should be chairs and a table, and if the room is large enough, the men's lockers can be placed therein. The men should be taught to keep the room clean and neat, and its furniture if of the right sort will conduce to this end. The lockers can be made of 12x12x60 inch expanded metal, the doors fitted with either rim or padlocks.

WORK SHOP.

A work shop of some kind is an absolute essential to every exchange, and there is no reason why it should not be well-equipped with a liberal assortment of tools adapted to the needs of the business. A small lathe, either foot or power, with emery wheel and winding spindle attachments and a light drill press, is most desirable.

A substantial bench so placed as to permit of working at it on all sides in a good light, with a machinist's vise and a carpenter's vise; a complete set of carpenter's bits and twist drills; saws; planes; files; try squares; draw shaves; hammers; soldering furnace, etc., are necessary. Plenty of drawer and shelf room should be provided to store supplies, and a rack for telephone instruments is also quite necessary. With the development of telephone service, special equipment is coming into daily demand, and in most cases both money and time can be saved by building it at the exchange to suit the occasion.

WORK SHOP.

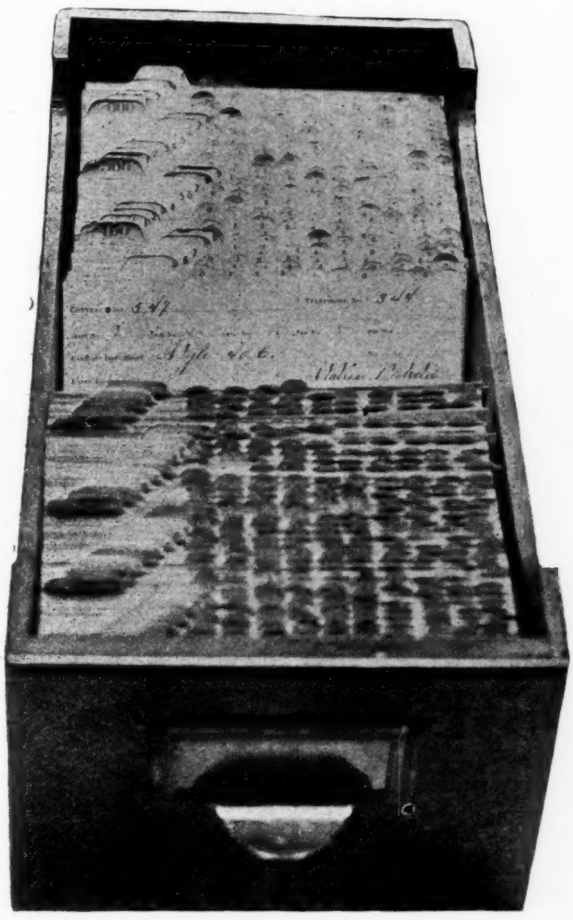
THE WIRE CHIEF.

One does not often meet with a really good wire chief in small offices because of salary limitations. With the increasing complication of circuits coincident with the introduction of common battery and special forms of equipment, the wire chief's position has increased in importance and the demand for technical knowledge on the part of the incumbent is fast becoming imperative. He should be a man possessing executive ability of the first order, with a thorough knowledge of circuits in general, as well as the particular ones pertaining to the equipment under his charge. A practical knowledge of trouble and inspection work; inside wiring and general construction, is essential, and he should also be able to use the galvanometer for cable test-

ing when necessary. His reasoning faculties must be well developed in order that in testing he can analyze the results of his test accurately and tell his men just what and where to look for their trouble.

DUTIES.

The wire chief is commonly supposed to have full charge of the maintenance department, which ordinarily includes



WIRE CHIEF'S NUMERICAL INDEX.

the trouble, inside wiring, and inspection. Whatever the range of his authority may be, he should have full control and responsibility for its efficient exercise unhampered by interference from the power above him.

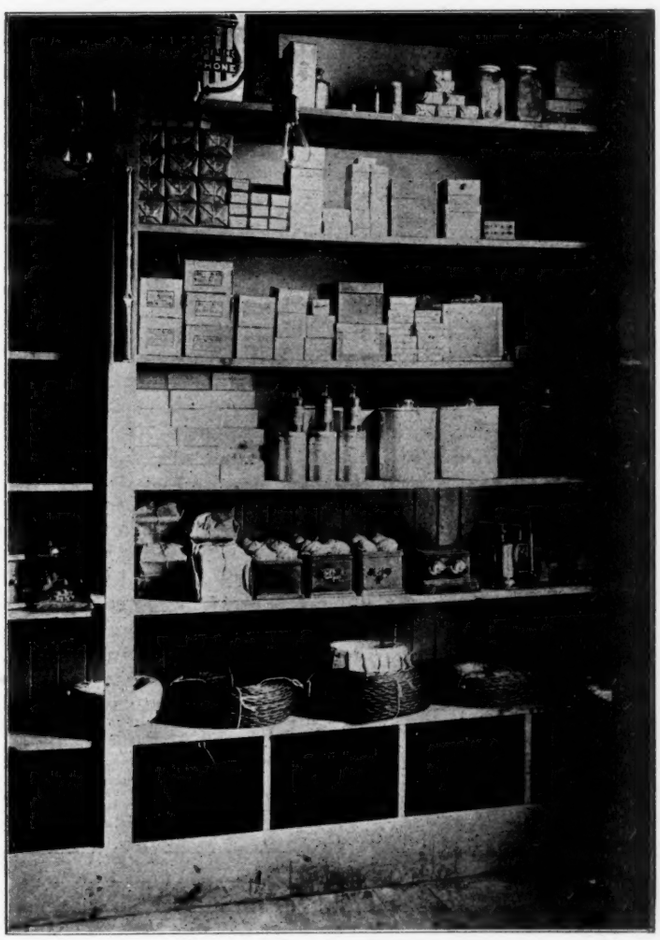
It is his duty to keep himself informed as to the routes and locations of all pole lines and their condition, the kind and character of all sub-station equipment, and must familiarize himself with the train schedules and transportation facilities of the district covered by the lines under his control, in order that there may be no unwarranted delay in the movement of his trouble force, to whom his word must be law.

It is his duty to test all lines and to indicate to the troublemen the nature and probable location of the faults in the cases to which he has assigned them, and after their clearance, to approve the same and make new assignments. From his trouble sheet before him, he knows at what time each man took his trouble; how many cases he is carrying; his route; the place from which he last called in, and the amount of time required to clear each line; in other words, the wire chief who knows his business can tell you without hesitation the approximate location and doings of every man on his force, facts which render "soldiering" on duty a rather hazardous occupation. "Practice makes perfect," consequently a good wire chief will become so adept at testing that indications which are meaningless to the average inspector tell the whole story to him, and in time he becomes so familiar with the various circuits that he knows them by heart, enabling him to save much time over the old arrangement of permitting each trouble man to "test out" his own trouble.

In the assignment of cases, the wire chief must give heed to the requisitions of the chief operator as to preferred trouble, and it is his duty to make repairs to any portion of the apparatus when requested so to do or when otherwise notified of the existence of faults.

In cases of unusual trouble, such as result from severe storms, it is customary to call on the construction department for assistance, in which event the city foreman oversees the general repairs to lines and the removal of crosses, moving his men in concert and harmony with the regular maintenance crew, the wire chief being in general charge of the whole.

The wire chief should test and approve each line upon which any work has been done, either original; additional; change; or repairs; when the same is called into him for test. And where possible, upon requisition of the city foreman, the wire chief should lend the assistance of his



CORNER IN THE STOCK ROOM.

force for construction work when the regular crew is insufficient to handle it.

VISITS TO OTHER EXCHANGES.

A person working by himself year in and year out without the opportunity of meeting and exchanging ideas with others engaged in a kindred occupation soon becomes narrowminded and ceases in time to keep pace with the growth of the business, therefore to occasionally send him to other

offices to study their methods will have a tendency to counteract the influences with which seclusion surrounds him.

THE WIRE CHIEF'S DESK.

This was once regarded as a luxury, if not a perfectly useless contrivance, but by progressive exchanges it is now regarded as an essential part of the system. Without some conveniences for the testing of circuits to ascertain their condition, trouble clearing becomes mere guess work.

The desk ought to be equipped and designed by the manufacturer of the switchboard, since it must be wired to operate in connection with the system used. The usual equipment of the desk consists of a volt-meter with a keyboard fitted with cams for cutting the same in series with the battery and the line, metallic, or either side of the line grounded; for cutting the voltmeter on either side of the line alone and for reversing it for potential tests; and for listening in and talking. There should be jacks terminating in cords on the terminal rack for in and out tests from the head; cords on the first operator's position and toll board, together with order wires thereto for ordering up connections for test; a private line to the manager's, chief operator's and cashier's desks, the storeroom and inspector's quarters respectively for the purpose of direct communication therewith; and a pair of jacks and drops terminating in regular exchange lines. The key combination must be such that grounds, crosses, short circuits, opens and reverses, can be unmistakably detected. The voltmeter can be used to measure resistances to a satisfactory degree if its own resistance is known, enabling one with practice to determine the location and character of instrument trouble quite accurately.

9

Exchange ..... Telephone No. .....
Contract No. ..... Class of Line .....

Panel No. ..... Jack No. ..... U. G. Cable No. ..... Pair No. .....
Aer. Cable No. ..... Pair No. ..... Pole No. A, Lead .....
Pin Nos. A, Lead ..... Pole No. B, Lead ..... Pin Nos B, Lead .....
Cable ..... Ft. Line ..... Ft. Kind ..... Running Wire ..... Ft.
Kind ..... Location of Cable Terminal .....
Route of Line .....
V. T. Metallic ..... Volts. V. T. Ground ..... Volts. Potential .....
Name .....
Address .....
Remarks .....
Kind of Equipment ..... No. .....
Style of Protector ..... Ground Connection .....
Extra Equipment ..... No. .....
Class ..... Location of Insts. .....
Date Installed .....

FIG. 20.

INSPECTORS AND TROUBLE MEN—REQUIREMENTS.

The model inspector or trouble man does not go about as a cowboy with a broad belt girlt about him bristling with a varied assortment of pliers, screwdrivers and connectors, but, on the contrary, he will carry a few small tools in his pockets or in a neat case, and the only marks of his calling visible to the beholder will be his spurs if in quest of line trouble. He will be a clean, bright, careful young man, in possession of a strong constitution. He will be polite to subscribers with whom he comes in contact; he will not smoke on duty; and will go about attending strictly to his own business. He will understand that it amounts to a crime to go after a case of trouble and fail to clear it, and that on general inspection it is a lasting disgrace to overlook any latent fault likely to cause future trouble. These things should be thoroughly impressed on his mind in the early stages of his training, so that adherance to them in after life will become his second nature.

Inspectors and trouble men can best begin as helpers to inside wiremen or installers, gradually working up through line work into trouble and inspecting. In large exchanges there is a great tendency to specialize, and some men do nothing but take care of instruments; some, the lines; others, the cable boxes. The combination man who can clear anything he goes after always commands the highest salary.

BATTERIES

Kind	Date Installed	By

MOVES AND CHANGES

Date	Work Performed	By

FIG. 20B.

TOOLS AND TEST INSTRUMENTS.

In addition to the short-nosed, side-cutting pliers which all inspectors carry, a pair of long-nosed, almost needle-pointed, five-inch pliers put together with what is known as a box joint—the lap joint being mechanically weak sidewise—and a pair of five-inch Swedish diagonal pliers, all

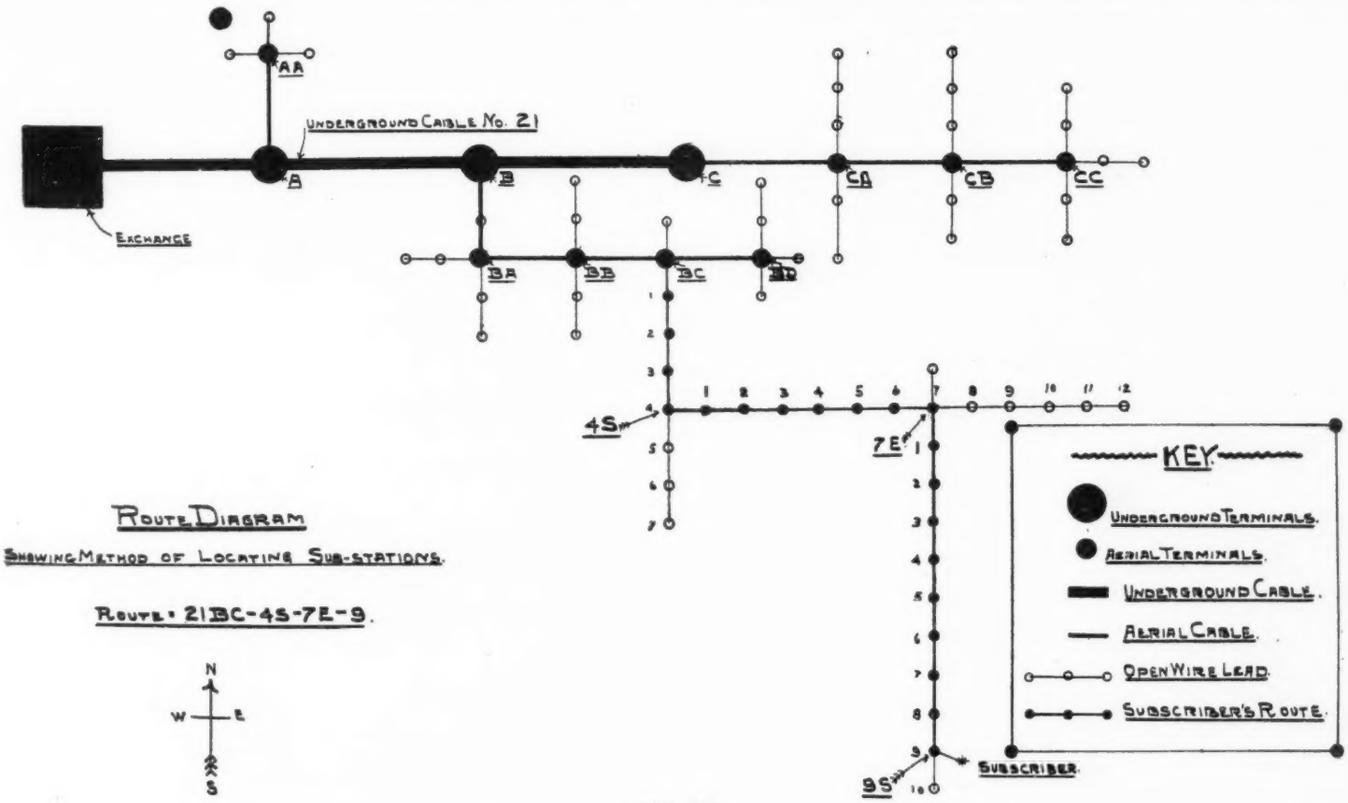
RECORD OF CABLE NO. .....

Make ..... Kind ..... Gauge ..... No. Cond'rs ..... No. Splices .....
Length ..... Ft. Capacity ..... Mfds. Insulation Res. ..... Megohms. Cond'r Res. ..... Ohms
Route ..... Date in Service .....
Location of Terminals .....

	Pair No.	Terminals. Looped	Multipled	Termina'd	Telephone Numbers						Trouble Record Date	Kind	Cleared	By	Test
	0														
	1	Length Optional													
	2														

FIG. 21.

the above of the very best steel money can buy, form a valuable addition to the inspector's kit. For testing purposes the ordinary operator's head telephone cannot be surpassed. It should be provided with a pair of four-foot tinsel single conductor cords terminating in strong snaps to secure them to wires or binding posts while testing. Even in magneto exchanges this compact little instrument can in many cases take the place of the cumbersome and heavy test set, while in common battery plants it alone is necessary. The number of so-called telephone men who are ignorant of the great utility and manifold uses of the receiver in testing and locating trouble is surprising. It is the expert cable man's greatest aid in determining the nature and location of faults, but to use it properly requires practice. In many cases locations of cable faults have been made with the receiver where owing to the condition of the cable it was impossible to successfully use the bridge and galvanometer. The remainder of the inspector's kit is too well known to require comment.



ROUTE DIAGRAM

SHOWING METHOD OF LOCATING SUB-STATIONS.

ROUTE: 21BC-4S-7E-9.

FIG. 22

INSIDE WIREMEN AND WIRING.

It does not follow that because a boy is out of a job and can get nothing else to do that he possesses the necessary qualifications for a wire man. This is the bottom round of the telephonic ladder and good, bright, capable, ambitious youths should be selected as helpers and carefully trained. The college student who has taken a technical course is pretty good material upon which to begin, but he must be taught to realize that the practical part of his education has only commenced. A young college man of the right sort by reason of his education has a wonderful advantage over others and will advance himself rapidly or not at all.

WIRING SPECIFICATIONS.

The work of inside wiremen should be done according to an approved set of specifications drawn up by a competent telephone engineer who understands the requirements from experience gained in actual practice. Some of the clauses in the underwriters' specifications are positively ridiculous and would bankrupt any company trying to carry them out; but the majority of them are excellent and should be referred to in draughting a set of wiring specifications.

While dwelling on this subject the writer cannot refrain from mentioning one or two details relative thereto, although it is beyond the province of this paper, and for the digression makes due apology. The proper place to attach the line drops at a subscriber's station is at the attic, preferably on a window casing, leading the drop wire into the building through two holes slanting upwards from the outside. Use for the drop a first quality No. 14 hard-drawn rubber cov-

MAINTENANCE DEPARTMENT.

THE _____ TELEPHONE COMPANY.

_____ Exchange. Trouble Report for _____ 190

Slip No.	Telephone No.	Name	Location	Trouble Reported	Rep't'd By	Time Rep't'd	Test	Time Taken	Repair Man	Trouble Found	Time O. K.	Total Time	Con. No.
		Length Optional											

FIG. 23.

ered and saturated braided pair wire. For the building attachment, a small malleable iron bracket fitted with a double groove No. 12 insulator. In most cases but one attachment is necessary. The wires must be led inside and about a foot left, after forming a drip loop outside. The inside running wire composed of No. 18 or 19 rubber covered and dry braided—oak color with a red marker wire, is then soldered to the drop wire and fished between the walls down to the telephone. All joints should be taped with the very

THE.....TELEPHONE COMPANY.

INSPECTION SLIP.

Telephone No.....Slip No.....Date.....

Name .....

Location .....

Reported.....By.....Time.....M

Remarks .....

.....

Time Taken.....M Time O. K.....M Repairman .....

FIG. 24.

best okonite rubber tape, next to the soldered joint, and the whole covered with the best friction tape to protect it against injury, the rubber tape keeping out moisture and arresting corrosion. Where dampness is to be encountered in a building or where appearance is not a prime requisite, the above wire with a saturated weatherproof braid should be used as the plain braid will in time develop low insulation and if exposed to the weather will crack. For most work the oak colored braid, with red marker thread on one conductor, is by far the best since in exposed places it is not so conspicuous as darker colors.

Contrary to general impression, concealed wiring is the safest, the neatest and the best. It must be properly done and all due precautions taken. Sometimes the amount of labor required is greater than it would be with an exposed job of equal magnitude, but unless the surroundings are fearfully crude the expense is justifiable and is a distinct economy. Generally speaking, exposed wiring requires more material than concealed work, and the latter, when well done, is permanent and protected from meddling and trouble. A skillful wireman will make no more work out

THE.....TELEPHONE COMPANY.

SWITCHBOARD TROUBLE SLIP.

Slip No.....Position No.....Date.....

Trouble Reported.....

.....

.....By.....Time.....M

Report .....

.....

.....

Time Taken.....M Time O. K.....M

.....Repairman.

FIG. 25.

of a concealed job than of an exposed one except in unusual cases where brick and stone walls are encountered.

One of the principle reasons for preferring attic runs with the wiring concealed to the instrument is that it removes the danger of the same being cut by burglars or being otherwise tampered with, and it further has the advantage of a greatly improved appearance.

RECORDS AND REPORTS.

The usual records kept by the wire chief or under his supervision are the numerical list of subscribers, cable, equipment, and dead line records. The issuing of stock-keeper's and construction orders, and the keeping of the trouble report also fall to his lot.

THE NUMERICAL LIST.

The numerical list of subscribers is best kept by a card index, composed of guide cards numbered by tens and hundreds, and record cards provided with unit tabs to facilitate reference. Figure 20 shows a card designed for this purpose, which is very satisfactory. The proper size for these cards is 4x6 inches. The back (Fig. 20B) can be ruled to show moves and changes, trouble, or battery renewals in plants where local batteries are used at the sub-station. In the case of party lines there would be a card for each party with the usual letter designation therefor back of the same number. In private exchanges, each station should have a card. This does not apply to extra equipment which is recorded on the same card with the master telephone.

Name ..... Contract No.

Address .....

	Construction		Batteries		Maintenance and Repairs				
	Yr.	Cost	Yr	Cost	1900	1901	1902	1903	1904
Jan.									
Feb.									
Mar.									
April									
May									
June									
July									
Aug.									
Sept.									
Oct									
Nov.									
Dec.									
Total									

Tel. No.....Rate.....Exchange.....

Equipment.....

.....Discontinued.....

FIG. 26.

It is expected that this record will furnish complete data of all that pertains to the line or equipment, from the switchboard to the sub-station, inclusive. It should be so complete in its character that all information in regard to the physical properties or characteristics of the line and apparatus can be quickly and accurately ascertained. The proper place for this index is in a case close to the wire chief's desk.

THE CABLE RECORD.

As its name indicates, the cable record is a compilation of data regarding all cables entering the exchange—see Fig. 21. It is made up in a book, with the record of each cable in numerical order of cable numbers, the number of the cable being determined from its position on the main distributing board relative to the others. It is customary to assign to aerial cables the same numbers as the underground cables to which they feed.

Cable records should show the location of each terminal, the length therefrom to the office terminal, the number of pairs bridled out thereat, and the subscriber's line jack numbers corresponding to each cable pair in use. It should be distinctly indicated just how every box or portion thereof is cut in, whether looped, bridged, or terminated conductors lead into it.

The numbering of cable pairs is governed by the order of termination on the office terminal, and this numerical succession determines the cable box in which the conductors are to be dead-ended, commencing with the first box from the office. For instance, if a certain 200-pair cable leading from the office terminates its conductors successively in eight 25-pair cable boxes, the numbers will run as follows: The left hand top pair in the first box from the office will be No. 0, the next below it No. 1, and so on running from the top down; the first pair in the second box will be No. 25 and the next below it No. 26, etc.; in the last box of the series the first pair will be No. 175, and the last pair No. 199. Conductors looped or multiplied take their numbers from the terminals in which they are dead-ended as before stated.

Terminals are preferably designated by letters. If there is underground work continued by aerial cable, the first underground terminal of each cable will be called *A*, the second *B*, etc. The first aerial terminal from the first underground terminal will be *AA* and the second aerial terminal from the first underground terminal will be *AB*. The first aerial terminal from underground terminal *B* will be *BA* and the second *BB* and the third *BC*, etc. This double designation is necessary only in the presence of both underground and aerial systems.

In addition to the above route description the cable record should give some general data comprising the date cut in, size of conductors, length, kind of insulation, electrostatic capacity, insulation and conductor resistance at the time of installation. Data of this kind is always valuable and greatly facilitates the location of trouble or faults that may in future occur.

TERRITORIAL MAP.

A districted map of the exchange territory is a most convenient and useful adjunct to every office. It should show the route of each cable and pole line, the location and designation of each cable terminal with an outline of the district fed thereby, together with the location and number of each pole. Poles are numbered from the terminal pole which feeds the lead of which it is a part. The first pole of each lead from the terminal pole is No. 1, and the routes are indicated by fixing the initial letter of the general direction of the lead from the terminal. Poles of branch and sub-branch leads are numbered in the same manner, but with reference to the junction pole of the main or branch lead from which they take off.

By following this method it is possible to describe definitely and concisely the route taken by any subscriber's circuit, and to obtain from this description a very accurate idea of the material necessary to construct it, giving a splendid check upon the construction department and the stockroom. For example, the location of a sub-station under the notation entitled "Route of Line, in Fig. 20, the designation "21BC-4S-7E-9" might be given. Translated, this means that subscriber's circuit takes underground cable No. 21 to its second underground terminal "B," thence aerial cable to

THE _____ TELEPHONE CO.

WIRE CHIEF'S REPORT. Month_____ 190

LINES.

Exchange	Last Report	Lines: Independent. Ins.	Independent. Rem.	Party. Ins.	Party. Rem	Trunk. Ins.	Trunk. Rem.	Toll. Ins.	Toll. Rem.	Other.		Leased		This Report	Gain.	Loss.
Total.																

STATIONS.

Exchange.	Last Report	Stations: Independent. Ins.	Independent. Rem.	Party. Ins.	Party. Rem.	Extension. Ins.	Extension. Rem.	Pay. Ins.	Pay. Rem.	Interior. Ins.	Interior. Rem.	Inst's Leased	Extension Bells. Ins.	Extension Bells. Sold.	Extension Bells. Rem.	This Report	Gain.	Loss.
Total.																		

Exchange.	Changes: Change of Location	Change of Position	Change of Equipment	Batteries: Renewals. Dry.	Renewals. Nun.	New Stations. Dry.	New Stations. Nun.	Sold. Dry.	Sold. Nun.	Trouble: Switch Board	Substation	Wire Plant	
Total.													

REMARKS_____

_____

_____

WIRE CHIEF.

FIG. 27.

the third aerial terminal "BC," from which it takes an open wire lead 4 poles south from the said terminal 21BC, thence 7 poles on a branch lead east from the pole 4S, and then on nine poles on the sub-branch route south from the junction pole 7E to the subscriber's station. This method has been plotted in skeleton form on diagram shown in Fig. 22, which is supposed to represent a map of the district fed by cable No. 21.

EQUIPMENT RECORD.

For purposes of record and identification, all sub-station equipment ought to have a serial number stamped plainly and permanently upon it. A complete record of each instrument can then be kept in a book arranged in numerical order, and giving location, date of installation, repairs, removal, and any peculiarities possessed by its parts, wiring or method of assembly. If this record is accurately kept it forms a reliable inventory of this portion of the plant, and will effectually prevent a loss of instruments by non-removal and is a detriment to theft.

THE DEAD LINE RECORD.

The dead line record can be made up from either discontinued numerical list cards or the stubs from move and removal orders filed according to cable district, with a small amount of trouble. When any portion of the line is used it is noted on the card or stub, keeping it up to date and enabling the wire chief to tell to a certainty just how much of a dead circuit is available for use in the construction of a new line in the same district. The value of system in this matter is better appreciated when an application for a rush order is received, and reference to the dead line record makes it possible to state definitely the length of time it will require to construct the line and install the instrument. Dead line cards should be filed in a tray made for the purpose, divided with blank tabbed guide cards. The arrangement is similar to the chief operator's street directory, but with major indexing cards dividing the streets into cable districts.

TROUBLE REPORTS.

A trouble report blank is shown in Fig. 23, which also answers as a log sheet, giving the wire chief close tab on the doings of his men on the same principle that a train dispatcher follows the movement of trains from the train sheet. Once every hour the chief operator reads off over the telephone to the wire chief all trouble unreported to him from her complaint report; that is, all trouble of a mechanical or electrical nature requiring investigation or repair. The wire chief will afterwards sign the complaint report for all the cases taken, thereby assuming the responsibility therefor. He will then test each case, noting the indications in the "Test" column, using the code referred to in a previous article. The case is next assigned to the first trouble man reporting in, and the time taken with the initials or number of the trouble man entered in the proper columns. With the sheet before him the wire chief is able to follow the movement of every man, knows where each one is, what he is doing, how long he has been working on the case and whether or not he is making progress. Unless the wire chief knows his business this method will not teach him what his previous training should have already done, but it will enable a good man to do much better work and accomplish more with greater ease than with no system at all.

INSPECTION SLIPS.

The trouble is read off from the trouble report to the trouble men by the wire chief, case by case, each man writing out his own slips (see Fig. 24), which he takes with him as a memoranda of his assignment. When assigning the cases the wire chief quoting from the sheet comments on each case, stating his conclusions, and gives instructions as to where to look for the trouble. The men are expected to call in frequently to test with the wire chief until the trouble is found, cleared, and they receive his "O. K." and "Next Case." As each case is cleared the inspection slip is filled out and signed, and the remaining columns on the trouble report likewise filled out—the last column being for the account or contract number to which the cost of repair is to be charged. Once a day the inspection slips are turned in to the wire chief, who, after examination, sends them in to the chief operator.

For switchboard trouble, on apparatus from the main distributing board in, switchboard trouble slips are used—Fig. 25. When the trouble is anything pertaining to a subscriber's line circuit, as, for instance, the line and cut-off relays, line jack, lamp, etc., the slip is filed with the regular trouble slips in the envelope pertaining to the telephone to whose circuit the defective part belongs. The slips for switchboard trouble of a general nature, such as cord-circuit trouble, etc., are filed and classified according to the apparatus wherein the trouble occurred.

The final disposition of the trouble report and inspection slips has been explained in detail in the articles on "Traffic Department," to which the reader is referred.

THE COST RECORD.

The numerical index used for the cost record is an almost exact counterpart of the wire chief's numerical index, differing only in the printing of the cards, a sample of which is given in Fig. 26. This form will enable the cost of construction and maintenance on a line to be kept for five years without changing the cards. Sometimes this data is kept on the back of the wire chief's record, but it is not quite so desirable as a separate record. Line costs are filed by the contract number and indexed alphabetically by the contract index mentioned under "Accounting." The object of a cost record is to enable the manager to know just what lines are paying and what are not. Without this data it is virtually impossible to estimate costs intelligently.

WIRE CHIEF'S MONTHLY REPORT.

In exchanges of any magnitude, it is essential that the manager keep himself well posted with regard to everything done by the maintenance department. To this end, he should require from his wire chief a regular report of the business transacted during each month. A sample report is shown in Fig. 27, which covers the maintenance pertaining to three exchanges, all in charge of one wire chief. It shows the number of lines of various kinds, such as independent, party, trunk, toll and private lines which have been installed or removed during the month, together with the net gain and loss over the preceding month. It gives the same data relative to stations installed or removed together with their gain and loss. Changes of location, position and equipment, battery, renewals, and trouble are treated in the same way. All the above data is compiled from the records which are kept up to date in the manner heretofore described. The subject matter of the report to be required from wire chiefs in various exchanges will be governed largely by the scope of that person's authority, and will vary with different conditions. When drafting a form of report, it should be borne in mind that the object thereof is the collection of useful data which will show, not only the behavior and comparative merits of various classes of apparatus, but the administrative ability of the wire chief.

Telephone mistakes may have their serious sides. A man who wanted to communicate with another named Jones looked in the directory and then called up a number. Presently came through the receiver a soft feminine "Hello," and he asked, "Who is that?"

"This is Mrs. Jones?"

"Have you any idea where your husband is?"

He couldn't understand why she "rang off" so sharply, until he looked in the book again and discovered that he had called up the residence of a widow!—*Tit-Bits.*

QUESTIONS AND ANSWERS ?!?!

CONDUCTED BY J. C. KELSEY, PROFESSOR OF TELEPHONY, PURDUE UNIVERSITY

In looking over a description of a common battery exchange, I notice that one side of the line is permanently connected to one side of the battery. Kindly advise me if this will unbalance the line. Also advise me if a party on a common battery exchange can be called with connections as shown in Fig. 1. I have tried this method

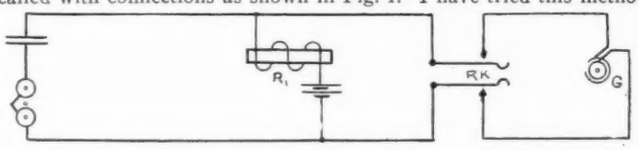


FIG. 1.

but find that the bell won't ring, and the brushes spark to a considerable extent.—R. R. J.

The circuit shown in Fig. 1 is certainly an unbalanced circuit, at least according to the extent of disturbing conditions. A circuit of this kind would not cause much noise in some localities if the relay were of low resistance like the Bell No. 25A, a ten-ohm relay, rendered non-inductive by a shunt winding of German silver in parallel with the copper winding. On the other hand, there are localities where a ten-ohm relay will unbalance a line to such an extent that no voice could be heard for the noise. Such a practice in switchboard design would not result in much satisfaction to subscribers. Many exchange owners go to great expense and trouble in putting up metallic lines of best construction, thoroughly well balanced, and then permit a switchboard salesman to unload a system of switching that will make every connection noisy. To ring, as shown in Fig. 1, in which the generator G and ringing key RK play a part, the sparking at the brushes would indicate an overload—a short circuit in this case, as the storage battery has no resistance to speak of and the relay R_1 undoubtedly has a low resistance. Such a method of ringing would be operative, if the

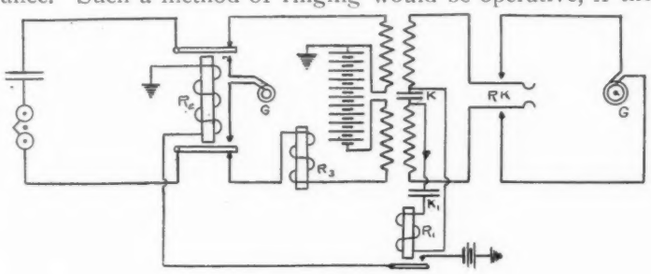


FIG. 2.

relay R_1 had a high resistance and lots of iron in the core. A twenty-cycle ringing current has not much fear of impedances, so the proper way would be to ring as is shown in Fig. 2, in which a relay R_2 is placed between the battery, and relay R_3 and the subscriber. Its contacts are so arranged that when the relay R_2 is normal, the current will flow to the subscriber, just as if the line were straight. When the ringing key is closed, a current will flow through the condenser K, and half of the repeating coil. It will divide, and some of the ringing current will flow through the condenser K_1 and relay R_1, which is in parallel with the condenser R at the repeating coil terminals. It is designed to operate on alternating current. The contacts close a battery circuit through the relay R_2 directly in the circuit, which being energized, opens the circuit back of it and lets a ringing current flow directly to the subscriber. This method is used by the American Telephone and Telegraph Company, for connection between the toll line exchanges, and common battery exchanges in which the toll line operator can order up a connection, and therefore put a busy test on the line that she is about to call. When the toll party is available, she rings on the trunk and calls the exchange party directly. Many times when a party in a large exchange is expecting a call, some local party calls him and keeps the long line in disuse for a time. This method allows the toll line operator to hold the line until she can use it. It is a good scheme from the long-distance standpoint. The operator is supposed to hold the line but ten minutes.

We have a line eighty-five miles long, copper metallic and well transposed. We have another line, metallic for seventy miles and grounded for fifteen miles. What we want to do is to make the combination of the seventy and fifteen mile available for telegraph purposes between certain hours of the day. What effect will this have upon our copper line?—F. T.

According to Fig. 3, the iron metallic seventy-mile line would offer a metallic path to the telegraph and the inductive effects would be nothing, for each side would overcome the other. The fifteen miles of single wire would

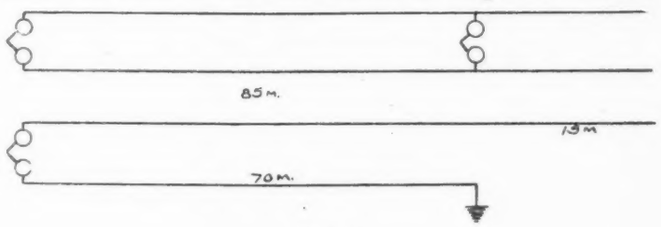


FIG. 3.

cause no trouble to speak of, as the distance is small. This method seems an awful waste, but you seem to think that the combined use of the lines for simultaneous telegraphy and telephony would not be feasible. You are the judge. As the telegraph is to be used from 9 a. m. to 3 p. m., it is to be suspected that the business on the single copper line will be too great. If the phantom method should be tried, as suggested in the September TELEPHONY, a great saving would result and service improved.

We have several long lines and find that we can make use of telegraphy over the same line. We have a chance to rent out this telegraph service to some people. Can you tell us what the service would be worth?—J. W. P.

To lease a circuit of this kind for telegraph purposes you are offering much better opportunities for uninterrupted service than a regular telegraph line. For this reason, when your telephone lines are out of order, you make an effort to repair the trouble at once. Repairing your telephone trouble always removes the telegraph trouble. If you had a leased wire on a regular telegraph circuit, when it got out of order you would have to report and wait the pleasure of the lineman. But when you are using a telephone line for that purpose you have two different people using it. If it gets out of order for one it will get out of order for the other. The chances are that the telephone company will detect the wrong condition at once and get at the trouble long before

the telegraph lessee can report it. It is said that the long lines charge $30 a year mile. I know of other companies who are charging twelve dollars a mile and are satisfied with profits. I would advise a charge of $15 a mile for the year. When this class of business is more fully developed one can see chances for this business for every telephone company and it should prove quite profitable.

In your November issue, you mention an exploring coil for finding cable faults. Can you give a description of such a coil, and how to make one or can you advise me where to buy the same? I should like to use one on concealed wire work.—G. E. R.

A most effective exploring coil can be made of a bicycle rim with the groove filled with fine wire and the ends connected to a receiver. It would be large for your work and a coil of much smaller diameter might be used. To walk into a common battery telephone exchange and hold the exploring coil over the batteries, one can hear all the parties in the system talking. I do not know where they can be bought, but they can be made for concealed wiring fault-finding, out of a rim six or eight inches in diameter, wound with wire to a pretty high resistance. Use No. 30 wire or smaller. Such a coil can be better made by experimentation on the part of yourself.

We have every reason to think that our underground cables are being destroyed by electrolysis. How can you tell exactly the nature of the effects, and how can it be prevented?—F. M.

Electrolytis action shows itself in a peculiar pitted appearance on the surface of the cable sheath. This action will speedily destroy the cable if not taken care of. This destructive action is not confined to cables, but water and gas pipes come in for their full share of the destruction. It is due to the street railway company using the pipes and sheaths as a return, in preference to thoroughly bonding their track, thinking, as may be supposed, that it is cheaper. If one will observe most any trolley system he will see great feeders going out of the power house, but he will not discover any leading back. It stands to reason that a poorly bonded rail will not carry all the current back. It will be hard for the street railway people to be convinced that in most any part of a city one can find a drop of ten or twelve volts per mile. Take a single block, drive two ground rods, connect them together through a receiver, and you will realize that earth currents are flowing. A voltmeter might show that the block has a potential drop of one volt.

Cable sheaths are of low resistance—about an ohm or less per mile. They certainly offer a more attractive path for the return currents than 176 rusty rail joints. Foreign currents then flow through the sheaths and it is where this current leaves the cable sheath to the earth that the corrosive action takes place. The existence of this dangerous condition where the current is leaving the sheath is shown by the voltmeter giving a reading showing electro-positive. To prevent this trouble, where no reading exists, or where a reading shows an electro-negative condition, cables must be entirely insulated, which would be impossible. To prevent this current from leaving the sheath to the earth, and to do it properly, the cables should be bonded by wires of low resistance. Tinned No. 10 copper will do. This makes the system uniform. Then connect this bonded system to the ground at the street railway station by suitably large wires, so that no current will flow from the cables carrying great currents. While these have no direct effect upon the lead sheaths in combination with the earth, salts will be formed which will work even while the current is stopped. Therefore, one is liable, while trying to protect himself from one enemy, to find another enemy just as bad. The street railway company would favor the too large connection wires, for it will save them certain losses.

Generally street railway companies have the trolley wire positive. The reverse condition is the worst, and there are times when the trolley conditions may be reversed for a time. By taking frequent readings this condition will be quickly discovered and the railway people should be notified. As a rule they will co-operate with the telephone company, unless the telephone company has been unwilling in the past to be of service to them. However, this will not apply to the new Independent companies. I would urge periodical surveys and the keeping of a map showing polarities, day and night. The closer to the power house ground the test is made the more care should be exercised. Note not only the direction of the deflection, but the extent of it and the exact time the reading was taken. Each cable department will find it of advantage to do this work conscientiously and not always take a reading with the nearest and easiest accessible ground.

I have a series grounded magneto exchange, and I desire to know some circuits of a wire chief's desk and some methods of testing.—C. S.

There are two ways of getting at the trouble from the wire chief's desk. One is to have a cord and plug ending at some point of the switchboard multiple, to be put up and pulled down by an operator at the will of the chief inspector, or for the chief inspector to have what is called a shoe, which fits on the terminal contacts, after the heating coils are pulled out. The first method is easy for the inspector, because he

FIG. 4.

can sit at the desk and measure the lines right through the board and heat coils.

For the wire chief's desk there should be several lines from the multiple board. If a party wants to report his lines to the inspector he does not want to be told that the line is busy, so two or three lines should connect the board and the chief's desk. Fig. 4 shows a line ending in a jack at the

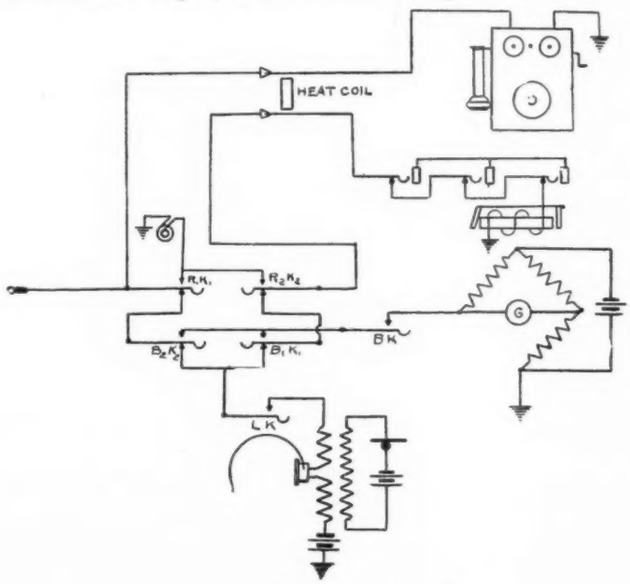


FIG. 5.

inspector's desk, and a multiple of jacks and a drop at the switchboard. The chief can use these lines for any purpose. Fig. 5 shows a simple wire chief's circuit used in an old exchange of this kind. One side of the shoe and the plug ending at the multiple board were a part of the cord circuit. With the shoe on the terminal springs, the party could be

called by pressing key *R1K1*. If the plug were in the multiple he could call the party with *R1K1* and could talk with key *LK*. By ringing on *R2K2* the operator could be called, and the subscriber, the inspector and the operator could talk on the line. The shoe is therefore necessary for this work. If the inspector is satisfied that the trouble is outside he can have the line plugged up and can measure the line with the bridge. As the series bell has an 80-ohm bell and a short-circuited generator, and the line a known resistance of 100 ohms, a bridge reading of 180 ohms would reveal the conditions all right. Suppose by pressing key *BK* a reading of 50 ohms is observed. It would prove a cross half way to the subscriber. If the shoe were used, as the trouble is not easily located in or out, then if inspector pressed key *G2K2* and *BK*, the bridge would be put on the subscriber's line and readings taken. Pressing *G1K1* and *BK*, readings could be taken toward the switchboard. As an 80-ohm drop is used, a reading of less than 80 would reveal some cross or some jack trouble. As a rule, the inspector considers himself an outside man and there is generally a tendency to throw the trouble on the inside man. This costs the company money to see-saw on the proposition. The working of a bridge is familiar to all and will not be explained.

What can we call a message by telephone?—J. U. G.

Unfortunately the telegraph and phonograph have robbed the telephone of a word. The word accoustigram might express the message meaning, but the query department does not care to vouch for the word. It is up to some modern Noah Webster.

We have metallic lines and would like to have two-party service. We used what is called a split ring, that is, ringing out on each side of the line to ground, but a trouble comes in when the subscriber rings up. He rings the other subscriber's bell, and calls him at the same time he calls the operator. We then could not give any subscriber a single ring, being compelled to give that ring to central and gave up the service. What can be done to prevent the other subscribers' bell from ringing?—L. E.

The simplest method of overcoming this is to provide each subscriber with continuous current or pulsating current generators. As you will find, a pulsating current will not affect an alternating current bell, but, on the other hand, an alternating current will ring what is called a biased bell—one that will respond to certain pulsating currents. The pulsating generators may be bought in the market. Two-party service with a good selective ringing device is just as good as single-line service. I once had four-party selective service for a year and never knew that three other parties were on the same line. Switchboard apparatus is much cheaper per line than the line itself. A thousand line common battery board will cost $21 a line. Who can build two mile line or larger for $21 each? Not many city companies would attempt it. I want to add that the pulsating generators for the two-party service must stand normally open.

Since the trolley line was built in my vicinity, I find that the metallic lines, when accidentally grounded on one side, are unusually noisy. It used to be that an ordinary ground would not seriously affect the lines when connected with a grounded line without a repeating coil. Why is this great difference between old and new conditions?—A. M. C.

Your lines are now subjected to an electrostatic stress of 500 volts. That is easy to insulate for and the line will not break down, but when the line is grounded on one side this electrostatic stress of 500 volts causes heavy charges on your line to discharge to earth unequally. By this I mean that one side conducts the charge directly to ground and the other side delivers its charge to ground through the bridged receivers—hence the noise. Before the trolley existed your lines had no electrostatic stress nor any grat charges on them waiting to get to earth, and when one side of the circuit happened to be grounded, there being no charges on either side of the line, there was nothing to flow through the bridged receivers and therefore no noise.

In regard to noisy lines discussed in the October and November TELEPHONY, as to the line running into Cincinnati, we did not understand your test as stated in October TELEPHONY, but we have now made the test you described in the November TELEPHONY and have located the trouble. The test was made as follows: We cut the line two miles from the exchange and connected to the long Cincinnati line and found no noise, proving the trouble farther on. Two miles farther we cut the line and found that the line was noisy upon the long connection. We had an instrument between the two tests, where the trouble was found in the lightning arrestor. Disconnecting the ground wire, the noise disappeared. We put in another mica between the carbons, connected up the ground wire, and cleared the trouble. Since then, we have found the same trouble at other arrestors. This shows to us that the insulation of a line does not have to be so high as those lines entering cities where they have electric light and trolley wires to contend with.—B. C. Tel. Co.

Such a conclusion is a true one, and if every line after being built was connected to a long line running into a city the little troubles of the line would be revealed, which, though existing, would never be found out as long as used on strictly local service. The way to find a line of trouble of this kind is to open as the B. C. Telephone Co. did, and the trouble can be run down into the very close neighborhood.

SOUTHERN INDIANA TELEPHONE CONVENTION

The fourth annual convention of the Southern Indiana Telephone Association was held in Evansville, Indiana, on November 11 and 12, about seventy-five Independent telephone men being in attendance, and a very successful meeting was held. The telephone men were welcomed to Evansville by Hon. Charles G. Covert, mayor of the city, whose address was read by W. E. Clark, city clerk. C. D. Knoefel, who presided because of the president's illness, in response said:

"Gentlemen—You have heard the cordial welcome that the mayor has extended to this association. I want to extend in the behalf of the Southern Independent Telephone Association a hearty thanks to the welcome just read.

"Evansville, I am sorry to say, is lagging away back in the building of an Independent telephone plant. I am sure it is not the spirit of the Indiana people to be not up to the times. Evansville should have had this plant a long time ago, and it is the best place I have ever seen for an Independent exchange. I hope that before this convention adjourns that there will be enough spirit in the business men of this town to get the fever injected into them to take hold and build this telephone plant."

One of the principal papers of the afternoon session was one presented by City Attorney Funkhouser outlining the telephone situation in Evansville. It is published in this issue under the title of "Convention Papers."

The discussion was led by Mr. Armstrong, president Home Telephone Company, Louisville, followed by J. R. Tyler, Chicago; H. Langrebe, Huntingburg; L. G. Davis, Salem; H. J. Cole, Owensboro; F. E. Ebersole, T. H. Thom, Lamar, and others.

In the evening the visitors were surprised and pleased with the evidence of Evansville hospitality.

The second day's session was opened with a paper by C. D. Knoefel, entitled "Independent Long Distance Lines," followed by a paper by A. J. Payton on "Bell People as Antagonists." Short talks were made by E. W. Pickhardt, Hon. George A. Cunningham and a number of other prominent Indiana telephone men. After the papers a general discussion ensued, reports of committees were heard and officers for the next year were elected as follows: President, C. D. Knoefel, New Albany; vice president, L. G. Davis, Salem; secretary, E. W. Pickhardt, Huntingburg; treasurer, T. M. Thom, Lamar.

KANSAS CITY RATE CASE AGAIN BEFORE THE SUPERIOR COURT.

Some months ago City Counselor Ingraham of Kansas City prepared an ordinance which was passed by the common council of that city providing for a charge of $52 for office and $35 for residence telephones in place of $96 and $72, respectively, the former rate which had been paid to the Missouri and Kansas Telephone Company. The company refused to abide by the ordinance and proceedings were begun in the supreme court to compel the company to live up to its provisions. The supreme court ordered that testimony be taken, which was done early in the year before Commissioner Roberts, who was specially appointed for the purpose. This testimony was submitted to the court and the finding was against the company. The company still being reticent, mandamus proceedings were brought in the supreme court to compel a complaince, which were argued October 28th before the full bench of judges. The legal question involvced turns directly on the right of a municipality under the Missouri laws to arbitrarily fix the rate to be charged by the company. The city claims that it has this right under its charter given by the state; that the state has delegated to the municipality the right to determine what is a reasonable rate for service under the power of police regulation; further, that notwithstanding the quasi-public nature of the company the matter is local and within the charter provisions of the city. The company took the position that the city had not this authority because the charter which the company had received from the state placed it above any municipal control affecting so vital a question; that if any change of rates was to take place the authority must come from the state itself; also, that the duty in fixing rates was interfering with interstate commerce. The arguments were taken into consideration by the court and pending a decision on the petition for a mandamus, T. J. Smith of Butler was appointed to take further testimony. The rights of the company and the city in the premises will be determined on finding out the plain intention of the legislatures that made the laws. It is doubtful if the company will gain much by raising the question of interference with interstate commerce owing to the fact that the company is a local concern within the city in so far as this controversy is concerned, there being no discrimination between outside companies and those within the municipality, a condition which is always the basis of a claim of a violation of the interstate commerce laws.

Kansas City v. Missouri and Kansas Telephone Company, in supreme court, Missouri. Case pending.

PECULIAR SUIT IN IOWA.

October 29th, an injunction was asked for by Dr. J. W. Osburn, a physician of Des Moines, to compel the Mutual Telephone Company to cease sending out to its subscribers a certain list of its patrons, among them being Dr. Osborn, on the ground that whereas the doctor is a regular physician and surgeon, he is advertised in the subscriber's list as an "osteopath" to the two or three thousand subscribers and the many others who would have occasion to use the list and will be thereby damaged in his business if the list is allowed to reach them. The doctor claims that as soon as he noticed the error in the list furnished him he promptly notified the company and requested it to correct the mistake. The company, as is alleged, refused to comply and the doctor has asked for the restraining order. In addition the doctor asks that the company be compelled to send out a new list in place of the incorrect one.

Dr. J. W. Osborn v. Mutual Telephone Company, in district court, Des Moines, Iowa. Case pending.

REFUSED TO CHARGE THE JURY AS REQUESTED BY COMPANY.

While engaged in laying a conduit on the westerly side of the car tracks along South Salina Street in the city of Syracuse, New York, the Central New York Telephone and Telegraph Company was compelled by the advent of darkness to leave the open ditch and several larger openings which were being dug for the placing of the necessary manholes to gain entrance into the conduit, open over night. The ditch was about three feet from the car tracks and a more or less regular strip of street was left of this width between the ditch and the rail, the earth having been thrown to the westerly side of the excavation. The places for the manholes requiring larger excavations, the strip at these places was correspondingly narrowed. Proper red lights were placed by the workmen of the company at convenient places along the ditch and the work was left for the night. In the evening Dennis Walsh and a brother were riding south on the street, abreast, one between the space of the westerly rails, the other in the space between the tracks. The two seeing an approaching car, Walsh turned to the right and rode along the strip and finally into one of the manholes and was injured. Suit was brought against the company and a verdict was rendered at the trial in favor of the plaintiff by a jury. The case was then appealed to the appellate division, fourth department, and by a divided court the verdict was sustained. "At the trial the defendant company contended that it could not place any barriers or lights on the easterly side of the trench on account of the projection and overhanging of the running boards of the cars, and also that the plaintff was guilty of contributory negligence in riding his bicycle so close to the trench." The company also asked the trial judge to instruct the jury that the "red lights and the dirt thrown up in the excavation of a trench indicated that there was danger, and that the plaintiff was bound to exercise *unusual care* in passing that locality, and that by "unusual care" was meant greater care than would be required in passing over a street without obstacles, and in which excavations did not appear. The trial judge refused to grant this request. The court of appeals, from whose opinion the above quotations are taken, thought differently. At the trial the jury was left to itself to determine whether the injured person should have exercised any "unusual care" and in the opinion of the court of appeals this was a prejudicial error in favor of the plaintiff. The situation was pre-eminently a dangerous one and the jury should have been told so when it retired to give its verdict. In this court the verdict was reversed and sent back for a new trial.

Walsh v. Central New York Telephone and Telegraph Company, 68 N. E. 146. Decision of lower courts reversed, October 6, 1903.

EMINENT DOMAIN IN NEW JERSEY.

In the case of Coles v. Midland Telephone and Telegraph Company the New Jersey courts have held that the act of March 19, 1900, amending the telegraph company act of April, 1875, wherein the entire section as amended was inserted in the new enactment, and the clause providing that companies organized under the act might use public roads for their poles on first obtaining the consent in writing of the owner of the soil was repealed, did not repeal at the same time the right of acquiring the right to use public roads for the placing thereon of poles and wires by means of condemnation proceedings granted by the act of March 11, 1880. In case the owner of the soil refuses to give the consent the companies of this state may proceed to acquire under the right of eminent domain.

Coles v. Midland Telephone and Telegraph Company, General Digest, Vol. 15, 1541.

NO UNNECESSARY DELAY IN ACTING ON APPLICATION.

As a result of the decision of Judge Nippert of the probate court of Cincinnati, Ohio, the Cincinnati Telephone Company is defeated in its attempt to secure a franchise which was asked for, owing to the alleged delay of the board of legislation of the city to grant the franchise January 5, 1903. On that date the company filed an application with the board of legislation setting forth its requests for a franchise and for the city designate the rules for the company to follow and the location of the poles and wires. The application, however, was not acted on and May 6th the company brought suit in the probate court to have that court designate the conditions under which the company would be allowed to use the streets for telephone purposes. This suit was brought under statutory authority, a proceeding which is allowable under the Ohio statutes to secure franchise rights when the proper legislative body of the municipality refuses or neglects to act in the premises. This allegation of delay on the part of the board was made by the company. Judge Nippert, however, said that there had been no unnecessary delay owing to the peculiar circumstances of the case. The judge said that the board of legislation at the time that the application was made was existing without authority. The act which had created this board had been declared unconstitutional and provision was made that it go out of existence early in May, 1903. Judge Nippert thought the course which its members pursued in not acting on the application was justifiable under the circumstances. As a matter of fact the act of the old board would have been without authority in law and it is as well for the company that no action was taken. The decision denying the petition to the court for a franchise will compel the company to go before the new board called the council, which was created to take the place of the old board and there renew the application for the franchise.

Petition of the Cincinnati Telephone Company, in probate court, Cincinnati, Ohio. Denied October 24, 1903.

THE CITY OF WICHITA AGAIN BEATEN.

The well known controversy between the city of Wichita, Kansas, and the Missouri and Kansas Telephone Company, which was decided some time ago in the federal courts in favor of the company, has been begun anew in the state courts and by a decision of Judge Dale sustaining the demurrer of the company to the suit of the city to take away the franchise of the company and oust it from occupying the city streets with its poles and wires, has been again temporarily decided in favor of the company. Judge Dale held that even if the effort to take away the franchise were successful that the city could not bar the company from operating within its limits. The city relied on a state law providing for the termination by cities of the first class of franchises similar to the one in question and expected that having terminated the franchise that the court would order the company to remove its properties from the city. Judge Dale said that regardless of the fact whether the franchise were terminated or not, the telephone company could not be ousted entirely. The city might regulate the operation of the company under the police power, but under the law could not drive the company out. The city had the power to designate what streets the company might occupy, but would have to allow it on some certain streets which the city would have authority to name. The decision of Judge Dale affects all cities of the first class in Kansas and if carried to the higher court and sustained will change materially the status of telephone companies generally. In the United States court the case was decided against the city on the ground that the franchise granted to the company in 1896 had not been regularly terminated. The decision in the state court does away entirely with the franchise question, and establishes the company's right to occupancy of the thoroughfores of Wichita on a ground far more permanent than on a mere test of the company's franchise. The case has been appealed to the supreme court.

City of Wichita v. Missouri and Kansas Telephone Company, demurrer of company sustained October 24, 1903.

EVIDENCE WAS ONLY HEARSAY.

In 1894, four persons started a telephone service in Belair, Maryland. These men organized a general partnership business. In 1895, the originators admitted two or three other persons into the organization and in September, 1895, the firm became incorporated under the name of the Harford County Telephone Company. It was understood between the several parties that by the reorganization the company became the owner of the electrical equipment and wires which had been owned by the individuals who composed the co-partnership. No written transfer, however, was made of the properties. While the service was still under the control of the four originators, wires were strung out a certain street on the electric light poles of the town to make connection with the telephone in the residence of one Dr. Richardson. This telephone was afterward taken out, but while the service was still in the hands of the co-partners. The wires were allowed to dangle on the ground and no further attention was paid to them by the parties who first placed them in position. In April, 1902, while crossing the street, Rebecca Lee tripped on one of the loose wires, fell and was injured. At the time of the accident the wires of the Harford company was being operated by the Maryland Telephone and Telegraph Company. Suit was brought against the two companies, jointly, on the claim that they were in control of and were responsible for the dangerous position of the wire. The point at once turned on the question whether the Harford company or the Maryland company or either of them was in control of the particular wire which was the cause of the injury.

The evidence of John H. Reckford, who had been connected in various capacities in the company, was submitted by the plaintiff, according to the report of the court of appeals, where the case was carried, which is as follows: "that he (Reckford) knew from correspondence and conversation with Mr. Brown, who was an officer in both corporations, that the telephone wires in question belonged to the Harford company, but he did not state what the conversation and correspondence were by which he had arrived at the conclusion. He also testified that he had called the attention of the managers of the telephone company to the presence of the loose wires on the street and that the latter promised to remove them, but did not do so. This witness admitted on cross-examination that he did not know of ***his own knowledge*** who had put these wires on the light poles, or whether Dr. Richardson ever had a telephone in his house, or that the telephone company had, while he was one of the directors, ever put any telephones on the street. So it is apparent that his belief as to the ownership of the wire

in question rested upon hearsay. Walter Finney, who was one of the promoters of the Harford company, testified for the plaintiff that he never heard of the telephone wires on this particular street until some time after the company had taken hold of the telephone enterprise, and further testified that the company had never exercised any acts of ownership over the wires or had had anything to do with them." Summing up all the plaintiff's testimony the court was of the opinion that there had not been a sufficient showing to establish any liability on the part of either defendant, and that the trial judge was correct in taking the case away from the jury in the lower court.

Lee v. Maryland Telephone and Telegraph Company, et al., 55 Atlan. Rep. 680.

WIRE IMPROPERLY FASTENED.

The New York Telephone Company had maintained a wire for over two years across a public street from an old brick chimney on a low building some two hundred feet away. During the progress of construction of another building in which a hoisting derrick was being used in a position near the telephone wire, one of the arms of the derrick caught the wire and the strain on the chimney caused it to fall to the ground. Parts of the chimney struck a pedestrian and inflicted injuries for which suit was brought. The New York courts held that the negligence of the telephone company in allowing the wire to be supported in the above way was the proximate cause of the injury.

Leeds v. New York Telephone Company, 80 N. Y. Supp. 114.

MORE LITIGATION FOR THE MICHIGAN TELEPHONE COMPANY.

The above company in stringing its wires along Water street in Port Huron, had fastened a guy wire between two telephone poles at a peculiar angle in the street. This wire was overhead some twelve feet from the ground and ordinarily was out of reach of persons passing. By a severe storm which had put out of commission a large number of wires throughout Michigan, the telephone wires along this particular street had been thrown down and this had so loosened the guy wire that it had sagged near the ground. Matthew Friesenhan, a milkman, was driving along the street and his horse drew him against the wire and injured him. Friesenhan brought suit against the company in the circuit court at Port Huron before the late Judge Thomas, charging negligence against the company for sustaining the wire in a position liable to become dangerous. The company answered in defense that Friesenhan's contributory negligence was as much the cause of the injury as the position of the company's wire. Judge Thomas agreed with the telephone company and directed a verdict for the defendant. The case was heard before the supreme court recently and the opinion was there given that the questions of negligence on the part of the company and the contributory negligence on the part of Friesenhan were properly questions to present to a jury and should be decided in this way, reversed the judgment and ordered a new trial.

Friesenhan v. Michigan Telephone Company, 96 N. W. 501. Case decided September 15, 1903.

HAS BEEN IN THE COURTS MORE THAN TWENTY YEARS.

Prior to November 10, 1879, the American Bell Telephone and Telegraph Company and the Western Union Telegraph Company was each engaged in the telephone and telegraph business. On that date the two companies entered into an agreement whereby the former was to remain wholly out of the telegraph business and the latter was to keep out of the telephone field. One of the items of this agreement was that the American Bell Telephone and Telegraph Company should have exclusive rights to the telephone patents owned by the Western Union people and in consideration therefor was to pay to the telegraph company an annual rental of twenty per cent of all moneys received for the use of telephones in the United States licensed by the Bell company. This bonus was regularly paid by the telephone company, but after a time, as was alleged in the original suit, the Western Union found that the other party to the agreement had failed to abide by its provisions and was leasing telephones to various companies and receiving in payment stocks of these companies. The telegraph company claimed that the payment in stocks was an equivalent to a payment in money and demanded twenty per cent of all stocks received in the above way. The payment was refused and suit was brought and continued for the ratio claimed due on all stocks received in payment of rentals received by the telephone company up to November, 1896, the time at which the original agreement expired. As the time grew greater, the amount claimed to be due increased until it finally reached the sum of $18,000,000, when the contract expired.

In the United States circuit court the case was decided not long ago in favor of the telephone company and was carried to the court of appeals at Boston, where a decision was given October 7. Press reports say that the case will be carried now to the supreme court.

American Telephone and Telegraph Company, United States circuit court of appeals, Boston, Mass. Decided October 7, 1903.

STATUTES GIVE RIGHT OF ACTION FOR PERSONAL INJURIES.

In the New Hampshire superior court, Lizzie J. Poff brought suit against the New England Telephone and Telegraph Company for injuries alleged to have been caused by the company to her hubsand from which he died. The accident and his death occurred nearly six years before the suit was begun. The company made a motion in the superior court to dismiss the proceedings on the ground that the period which the statutes provide for the beginning of actions for personal injuries had expired. The motion of the company was denied and the case was thereupon carried to the supreme court at Hillsborough.

In the higher court the subject of the right of any party other than the deceased in the absence of statutory authority to begin a suit for personal injuries was discussed. The common law rule held that no person but the one injured could bring a suit for personal wrongs. The rule was founded on the principle that the individual injured was the only one who endured direct suffering and that he was the only person who had any claim. If the injured party died, inasmuch as he only had a claim to have his wrongs righted, the right itself also died and no person in this event could maintain a suit. In the absence of legislative action this is the rule of law in all jurisdictions. The legislatures, however, of probably all of the states have abrograted the common law rule and have made various provisions for what is technically called a "survival" of personal actions to the estate of the deceased in case of the death of the one wronged. This provision for the "survival" of these rights of action has opened the way for a great number of lawsuits which at the present time make up a large percentage of all the cases tried.

The New Hampshire legislature in 1891 made changes in the laws of previous years, particularly in regard to the time after the death of the injured party within which complaint for damages must be made. Sections 8-13, chapter 191, of these laws, provide that actions for personal injuries to the person, including those inflicted by persons while committing a felony as well as those through mere negligence, shall "survive" to the extent and subject to the following conditional provisions: "If an action is not pending owing to the death of the deceased and has not been barred by the statute of limitations, one may be brought for such cause at any time within two years after the death of the deceased party, but not afterwards." In view of the fact that in this case

the injured party had died nearly six years before the suit for damages was begun was, in the opinion of the court, a complete bar to the complaint.

The statutory provisions do not alone defeat the *remedy* by suit for recovery after two years have elapsed, but in addition the court said that the legislative intent was that the *right* itself was barred. The right of making claim is only given by the legislature and never existed without legislative sanction. One making claim for damages of this character stands in quite a different position from a person suing, for example, to recover money due on contract. In the former he never had the right to make a claim until it was given by the highest legislative body in the state, while in the latter case the right itself is inherent upon default of the defendant. A claim of the latter kind passes over to the estate of the deceased exactly in the way a bank account does, while the other continues, or not, according to the laws of the state provided for such situations.

Growing out of the fact that personal actions "survive" only as prescribed by statute it follows that the administrator must adhere to the provisions thereof rigidly else the suit may be defeated even though the claim is within the statutory provisions. In the above case time had barred the right and therefore when suit was begun there was no valid claim.

Poff v. New England Telephone and Telegraph Company, 55 Atlan. 891. Decided May 5, 1903.

REVERSED A JUDGMENT FOR THREE THOUSAND DOLLARS.

Charles E. Cloman was a lineman in the employ of the Maryland Telephone and Telegraph Company. While he was sitting on a cross-arm at the top of a pole and engaged in stringing taut the wires, the cross-arm broke and precipitated Cloman to the ground, from which severe injuries were sustained. Suit was brought against the company and in the circuit court for Baltimore county, Maryland, a verdict for three thousand dollars was given by a jury. The case was then carried to the court of appeals, where the judgment was reversed and the case dismissed without the privilege of a new trial.

Cloman was a man of experience in the business in which he was engaged and testified that he had previously been working for the Chesapeake and Potomac Telephone Company in the same capacity. At the time of the accident, Cloman and another employe were stretching wires on the cross-arm with the assistance of what are called "jack-straps." The men were working about thirty-five feet from the ground and at the time of the accident, Cloman was near the end of the cross-arm. The cross-arm was of the requisite length to carry ten wires which was the number among which the men were working. Suddenly, while engaged in stretching the wires, the cross-arm broke with the results above mentioned. It was afterward found that at the place where the cross-arm broke there was a concealed knot. At this place also it happened that one of the holes for the insertion of the pin to carry one of the wires had been bored by the machine in the cross-arm factory. This hole, together with the presence of the knot, so weakened the arm that the added strain of the stretching of the wires together with the weight of Cloman's body, caused it to break. The arms had been painted at the factory and in such a way that neither the knot nor the fact that a hole was also bored through it could be noticed by an ordinary inspection. Cloman claimed that the company had been negligent in not supplying him with a safe place in which to work and that in consequence was liable in damages for his injuries. The court said that in view of the fact that the company had purchased its poles as other companies did; had used the ordinary methods in use by other companies to procure suitable material; that the accident was due to the presence of the knot in the cross-arm and the weakened condition due to the hole bored by the cross-arm factory, all of which was concealed from view and could not have been noticed by an ordinary inspection—in other words were hidden defects—that Cloman had no ground for a claim for damages against the company and that the plaintiff was bound to assume the risks of the character which were responsible for the accident.

The higher court criticized the lower tribunal for letting the case go to the jury at all, saying that the facts established by the plaintiff's testimony precluded recovery. The court further said that if the company could have been held liable at all it must have been because some one of its agents did not detect a defect which all of the evidence in the case tended to show could not have been detected by any method used in the business in which Cloman was engaged. "If there were any test which would have disclosed the defect, the plaintiff should have so proved; but, in the absence of such proof, the jury was not at liberty to assume that there was, and to speculate on the subject." No evidence to this effect having been given the case ought not ever to have gone to the jury.

Maryland Telephone and Telegraph Company v. Cloman, 55 Atlan. 681. Decided July 1, 1903.

TELEPHONE BOOTH DIDN'T MOVE.

Two telephone booths were placed recently in the first floor corridor of the New York city hall near the cluster of elevators at the northeast corner of the building. Whether or not they are to be permanently located there for the use of the public is not known, for telephones have not yet been installed in them. They are more ornamental and more commodious than telephone booths usually are, and each is provided with a revolving seat.

A few days ago one of the city hall guides was standing a few feet away from the new telephone booths when he was approached by a man of middle age who bore numerous evidences of hailing from some rural district.

"I want to go to the fifth floor," the stranger remarked.

"Take an elevator over there," replied the guide, waving his hand in the direction of the row of elevators and also toward the telephone booths. His interest in the stranger, who walked toward the elevator, ceased, but it was renewed again about five minutes later in a rather startling manner.

The door of one of the booths swung open and the head of the man who had been directed to the elevators popped out.

"Say, mister," the rural gentleman yelled at the guide, "when's this elevator going to start. I'm nearly smothered, and unless it gets a move on pretty darn soon I'll get out and walk."

His error was explained to him.

INCREASE OF TELEPHONES IN HAVANA.

W. M. Talbott, superintendent of the Havana Telephone Company, spoke recently of the growth of the telephone business under American control. The company has been in existence about 18 years, but only during three of that period has it been in the hands of Americans. The company now has a total of 2,200 subscribers in Havana, and is the most important line in Cuba.

Mr. Talbott said that extensive improvements are in contemplation by the company, including the establishing of long-distance connections throughout the island, connecting with the central plant in the city of Havana. The money for these improvements will be furnished by Americans, and Mr. Talbott said that it was estimated that a total of about $7,000,000 would be expended. The work will be commenced in about three months, and will render the main cities of the island all accessible by telephone with the capital.

Rural Telephone Delivery of Special Mail Matter*

HON. CHARLES W. FAIRBANKS

CHAS. W. FAIRBANKS.

I have been much interested in Senator Clay's statement of the development of the rural free-delivery service, because it is a service in which I have taken considerable interest from its early experimental days. As the honorable senator has shown, it has justified in the fullest degree the hopes and expectations of its authors. It has occurred to me that there is reasonable opportunity for increasing its efficiency and without any additional burden upon the government.

Everybody recognizes the very great convenience and benefit of the special-delivery service in many cities throughout the country. That service has thoroughly vindicated itself. It is not a burden upon the government. In fact, it annually yields the government a considerable profit.

It will be instructive to observe the result of the special-delivery business as set forth in the report of the Postmaster-General for the fiscal year ended June 30, 1901. The Postmaster-General says:

> The value of the special-delivery stamps used on this special-delivery matter was $713,326.30, and the amount paid for making deliveries was $542,128.01, leaving a profit to the government on the year's business of $167,727.73, after deducting $2,657.37 expended for car fare of special-delivery messengers in emergent cases, under authority of the act of Congress of March 1, 1899, and $813.19, the cost of manufacturing the stamps.
>
> Under authority of the act of Congress approved March 1, 1899, providing an available fund of $10,000 a year out of the revenue arising from special-delivery business for car far of special-delivery messengers in emergent cases where immediate delivery in the usual manner is impracticable, allowances for car fare were made during the year to the amount of $2,852.75, of which $2,657.37 was actually expended.
>
> The profit to the government from last year's special-delivery business was $147,820.95, and from this year's special-delivery business $167,727.73; an increase of $19,906.78, or 13.46 per cent.

It has seemed to me and to others also that the farmers of the country should enjoy the benefits of that service quite as fully as those who are in more thickly settled communities. The telephone affords a medium through which it would seem that the service can be largely and properly extended. It has been so thoroughly established in many sections of the country that it can be employed readily for delivering the contents of emergent letters or letters of special importance and under such conditions as to impose no additional expense whatever upon the government.

In many communities the farmers have their own telephones, and there would be little or no expense to the government in the transmission of the contents of letters requiring quick delivery by telephone. Where the telephones are not open to the use of the government without the payment of special toll, arrangement could be made by the Postmaster-General for the limited service required in the transmission of the contents of special-delivery letters upon reasonable terms. The government should be fully reimbursed by special-delivery stamps for the particular service rendered.

The subject is of such importance that we should request the Postmaster-General to make report upon it and advise the Senate whether in his opinion any measure of rural telephone service in connection with the postal service is desirable and feasible.

It may be more accurate to designate the particular service contemplated as "special rural telephone delivery of mail matter" or "rural telephone delivery of special mail matter," a service analogous to that of special delivery in cities. In the cities messenger boys are employed to make delivery. The question arises whether similar service may not be instituted in the country, and instead of making use of messenger boys we may not make use of the telephone.

The subject is a comparatively new one; the Postmaster-General can no doubt give a valuable opinion as to whether the subject is worthy of further consideration. I do not pretend to know whether it is or not; I am strongly inclined, however, to think that it is. The whole matter obviously is in the fullest sense experimental.

I observe by the report of the Postmaster-General for the fiscal year ended June 30, 1901, that, responsive to the public necessities, the telephone has been and is being used to expedite the collection and delivery of special-delivery mail matter. The Postmaster-General says:

> During the fiscal year permission was granted to a number of postmasters to inaugurate at their respective offices, under certain conditions, a system of collection and delivery of special-delivery mail matter in response to telephone or other calls. The plan, which was inaugurated during the last fiscal year, is thought to be a good one, and this office will sanction its adoption at other post offices where suitable conditions obtain and where the postmasters desire its institution.

There is in the proposition we are now considering no departure from the general principles upon which the entire postal system is founded. It is not paternalistic in its scope and purpose, unless the postal system itself is regarded as paternalistic.

It appears to me that there is a reasonable possibility to extend in a new direction a branch of the public service which verges almost upon the marvelous. Our vast and highly organized postal system is unexcelled and I doubt is equaled.

I shall offer a resolution, which I hope may now be considered, to obtain more light and a better opinion upon this matter than I profess to possess. As I have said before, the proposed extension of the service may be highly impracticable, and it may be that it should not be thought of further, but let us have upon the subject all attainable facts and the mature opinion of a wise and capable officer of the government—the Postmaster-General.

I do not desire to amend the pending bill, but should like to offer for the consideration of the Senate an independent resolution.

The resolution was read, considered by unanimous consent, and agreed to, as follows:

> *Be it resolved by the Senate,* That the Postmaster-General is hereby directed to inform the Senate to what extent and in what manner the telephone is used in the collection and delivery of special-delivery mail matter; and whether in his opinion special rural telephone delivery of mail matter is desirable and feasible.

*Speech in the senate of the United States by Hon. Charles W. Fairbanks of Indiana.

Paper telegraph poles are one of the developments of the art of making paper useful. The paper poles, now used to some extent in Belgium, are said to be lighter and stronger than those of wood and to be unaffected by causes which shorten the life of a wooden pole.

The Volt-Ammeter in Telephone Work

A. E. DOBBS

The combination of voltmeter and ammeter into one instrument is not an altogether new idea, for it was tried years ago, but not successfully, and as there was no very active demand for such an instrument, the matter was dropped. Recently, however, with the great increase in small storage battery and automobile plants, there arose a demand for an instrument that would combine the functions of both voltmeter and ammeter in a single case, and manufacturers taking up the problem at last succeeded in overcoming the difficulties of former construction, and the result is an accurate instrument with a single pointer and one scale indicating both volts and amperes.

The volt-ammeter then is simply an instrument that by a change in binding post or switch connections will indicate either current or electro-motive force as may be desired. We have, therefore, a small portable instrument doing the work formerly performed by two, combining the accuracy of its predecessors at a price slightly in advance of either one alone.

So far as the writer knows, there are only three manufac-

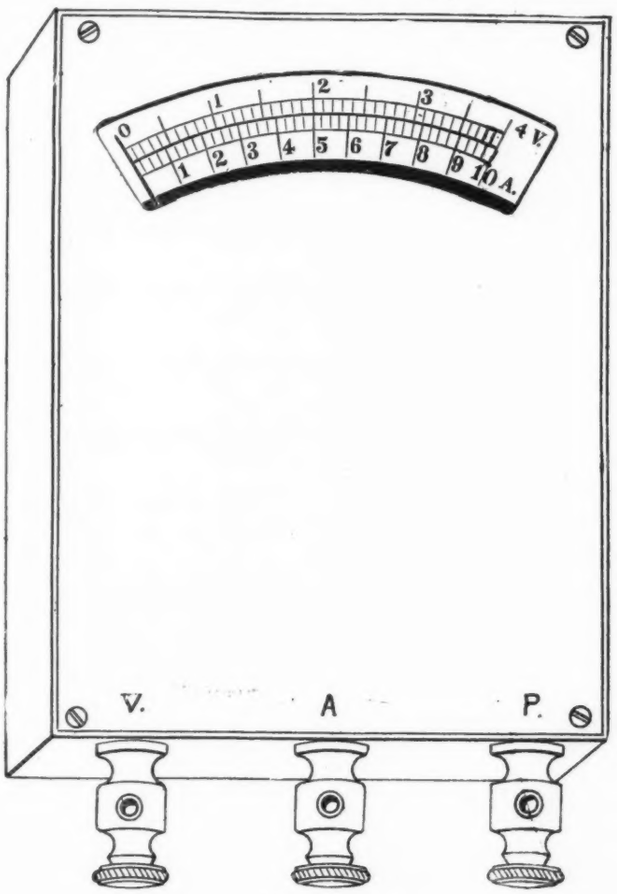


FIG. 1.

Pignolet's Volt-ammeter.—The upper scale reads in volts in 0.1 volt divisions; the lower scale in amperes. The position wire P is common to both scales. Connection of the negative wire to the binding post A gives reading in amperes while connection to V indicates battery voltage.

turers of these instruments. The Pignolet instrument shown in Fig. 1 has now been on the market about two years. This instrument is small in size, being 5¼"x3¼", so that it can be carried in the pocket. This type of instrument has two scales on the face, one usually reading to five volts in tenth-volt divisions, and the lower scale to fifteen amperes in half-ampere divisions. For those who want a high reading voltmeter a fourth post is added, so that we have three scales as follows: 0 to 130 volts on the upper, 0 to 6 volts on the second and 0 to 30 amperes on the third or lower scale. The Atwater-Kent volt-ammeter shown in Fig. 2 is a small

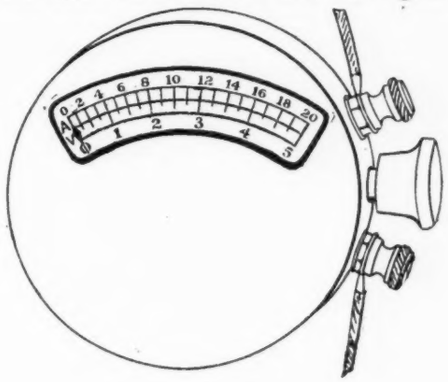


FIG. 2.

The Atwater-Kent Volt-ammeter.—A watch-pocket battery gauge. The upper scale reads in amperes and the lower scale in volts in quarter volt divisions. Normally the instrument reads in volts, the ampere reading being obtained by pressing the button in the center.

watch-pocket instrument intended for battery inspectors. It measures in both volts and amperes and in this respect is a great improvement over former battery gauges and voltmeters, for an inspector does not know the condition of the battery unless he knows its ampere output as well as its voltage.

Recently the Jewell volt-ammeter for small storage battery switchboards has made its appearance, which is intended to be a high-grade instrument with a long scale and very sensitive to small currents.

In the absence of a complete and expensive testing outfit no one instrument combines so many advantages for general telephone work as the volt-ammeter. Aside from its compactness and portability, it is not affected by vibration, induction or stray magnetism, so that it can be used in many places where the ordinary galvanometer and bridge would be useless.

The practical man who has become familiar with this instrument will use it in preference to all others in ordinary work, and the following list shows what is being done every day in factories and telephone exchanges, the work in some instances being intrusted to subordinates:

1. Measurement of voltage and current strength of batteries.
2. Testing of resistance in transmitters, receivers, induction coils, ringers and generators.
3. General inspection of telephone instruments.
4. Testing of line or cable resistances.
5. Testing the insulation of circuits or condensers.
6. Tracing the circuits through cables or switchboard.

To the man who has several hundred coils or condensers to test in the course of a day time is money, and when such a man having all kinds of instruments under his control habitually uses the volt-ammeter, it is fair to presume that he does so on account of its convenience and time-saving advantages.

BATTERY TESTING.

In battery testing it is not enough to take a battery gauge

or voltmeter reading. That is well enough as far as it goes, but it only tells half the story, for many batteries—dry cells especially—will give a very satisfactory voltmeter reading, but at the same time their internal resistance is too high to respond quickly to the pulsations of the transmitter circuit. Therefore it is necessary that we should know the current (ampere) output as well as the voltage, for the higher the internal resistance the less the amount of current given up.

Every purchaser of a large number of batteries should test them as soon as received, not only as a matter of self-protection, but also to accumulate data which will be of use in future buying. As an example we will suppose that it is stipulated at the time a lot of dry cells are purchased that no cell shall have a less output than one and four-tenths volts and five amperes through a resistance of one-fourth ohm which must be maintained for thirty seconds. Although this requirement is not a severe one, the inspector will be surprised in many instances at the number failing to meet this requirement in current output. Many times has the volt-ammeter saved the price of itself on a single shipment.

Again, a subscriber's telephone is weak and it is suspected that the battery is not up to its full strength. Putting the volt-ammeter in his pocket, he goes to the telephone and finds a cell giving only one-fourth an ampere and immediately orders a change, regardless of the fact that the voltage may be as high as 1.3, a very common occurrence.

TESTING UNKNOWN RESISTANCES.

While not possessing the wide range and close accuracy of a good Wheatstone bridge, yet within a range of from 10 to 2,000 ohms, such as is found in lines of moderate length, ringers, transmitters and coils of all kinds, its accuracy is close enough for all practical purposes, while the quickness of the pointer in coming to rest allows of tests being made with great rapidity.

Now a word as to close accuracy. Except in testing for cable faults or locating trouble on long lines, the telephone man is satisfied with an approximate accuracy, for he knows that lines as well as coils will vary in their resistance from day to day and that a few ohms one way or the other will make no practical difference. He also knows that coils of all kinds, even when wound by automatic machinery, will vary considerably, so that what he really wishes to know is whether a certain line or a certain coil has an approximate resistance of 100, 500, 1,000 or 3,000 ohms, which the voltmeter will tell him in five seconds without a troublesome setting of plugs to obtain the rather uncertain balance of the average bridge.

The voltmeter is especially useful in testing transmitter resistance, for we all know that a transmitter, even in a quiet room, will not remain quiescent long enough for a bridge measurement to be taken, whereas with a voltmeter it can even be subjected to a talking test while taking the average.

To subject the transmitter to a talking test, connect the primary circuit in series with the voltmeter and battery, using three or four cells, and talk into the transmitter, repeating words and phrases in a smooth, even tone. At first the pointer may swing with a variation of five or ten degrees of the scale, but in a few seconds it will settle down so that it fluctuates only between two or three points, which will represent the average resistance of the transmitter.

CALCULATING RESISTANCE.

The calculation of resistance by means of a voltmeter depends solely upon the falling off of the battery voltage when a resistance is connected in series with the battery and instrument. It therefore requires a simple formula to reduce the difference in voltage to ohms. This formula is so easily learned that a school boy who has studied decimal fractions can memorize it in a few minutes.

For ordinary work a voltmeter with a range of five or six volts wound to a resistance of from 100 to 150 ohms and a dry battery of three cells having a current output of not less than seven amperes, will be found most convenient. The three cells when connected in series should give four and five-tenths volts, but care should be taken that all binding screw connections are well made in order to prevent errors in reading.

As the falling off of the battery voltage is in exact proportion to the resistance of the circuit and the resistance of the voltmeter, there are two formulas that may be used, both substantially the same.

FIRST FORMULA.

This consists in finding the current constant of the voltmeter, which is the amount of current required to move the pointer over one degree of the scale. Thus with a scale indicating five volts in tenth-volt divisions there would be fifty degrees of the scale. To find the value of one of these we have Ohm's law, $I = \frac{E}{R}$, in which I is the current in amperes or fractions of an ampere, E the voltage of the battery and R the resistance of the circuit, which in this case happens to be the voltmeter.

Thus if our voltmeter resistance should be 100 ohms and the scale cover fifty degrees with five volts, we would have:

$\frac{5}{100 \times 50} = .001$ of an ampere as the value of one degree of deflection.

This allows the total resistance to be determined by Ohm's law, which is that the resistance of the circuit equals the volts divided by the amperes ($I = \frac{E}{R}$), and conversely, $\frac{E}{I} = R$, in which E is the voltage of the battery, I the current in amperes and R the resistance, from which we subtract the resistance of the voltmeter, whatever that may be.

Example 1.—We have a voltmeter with a five-volt scale (Res.= 100 ohms), and a battery of 4.5 volts. Upon inserting a resistance in the circuit we obtain a reading of two volts or twenty scale deflections. What is the resistance?

Solution: In this case we use the voltmeter as a voltmeter to obtain the pressure of the battery, and as a milliammeter when calculating the resistance. Thus we simply treat the two volts to equal twenty milli-amperes as .020 of an ampere, and then divide the 4.5 by this, adding two ciphers to even up the decimal places and afterward subtracting the resistance of the voltmeter.

Answer: $\frac{4.500}{.020} = 225 - 100 = 125$ ohms.

Example 2.—Scale, 100 volts; voltmeter resistance, 100 ohms; scale reading in two volt divisions; battery, 75 volts; reading through resistance thirty volts—what is the resistance?

Thirty volts in this case represent fifteen scale divisions, or fifteen milli-amperes.

Answer: $\frac{75.000}{.015} = 5{,}000 - 2{,}000 = 3{,}000$ ohms.

SECOND FORMULA.

In some instruments the resistance of the voltmeter is higher and the milli-ampere constant for each scale deflection no longer holds good, so that another formula which leads to the same result is more desirable.

Calling the full battery voltage E, the voltage through the external resistance e, the unknown resistance X and the

resistance of the voltmeter r, our formula can best be expressed as:

$$X = \frac{E \times r}{e} - r.$$

Or, *multiply the voltage of the battery by the resistance of the voltmeter and divide this result by the second voltage, obtained through the outside resistance, and then subtract the resistance of the voltmeter. The result will be the resistance of the external circuit in ohms.*

Example 3.—Voltmeter resistance, 100 ohms; battery, 4.4 volts; with an induction coil looped into the circuit the voltmeter indicates 1.2 ohms. What is the resistance of the coil?

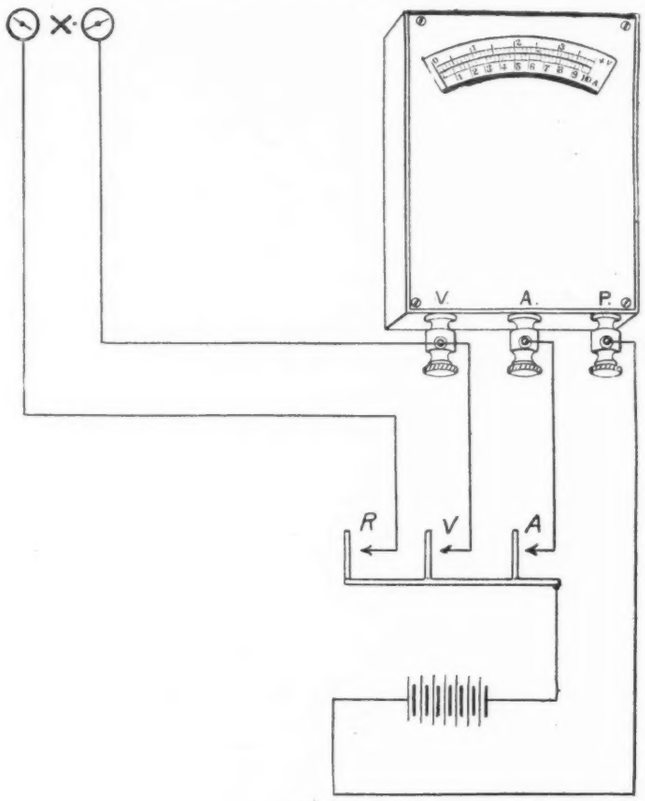


FIG. 3.

Connections to a box when used with a portable test set.—For an instrument with four posts add two more contact buttons.

Solution: In this case we have: E = 4.4; r = 100, and e = 1.2; therefore, $\frac{4.4 \times 100}{1.2} - 100 = 266$ ohms.

Example 4.—What would be the resistance if the voltmeter in the above case indicated 1.7 volts?

Solution: As r only is changed, we would have: $\frac{4.4 \times 100}{1.7} - 100 = 159$ ohms.

Example 5.—Voltmeter resistance, 150 ohms; battery, 4.5 volts; second voltage, 2.0. What is the resistance?

Solution: $\frac{4.5 \times 150}{2.0} - 150 = 187.5$ ohms.

Example 6.—What would be the resistance if the battery voltage was 3, instead of 4.5 volts, the other factors remaining the same?

Solution: $\frac{3.0 \times 150}{2.0} - 150 = 75$ ohms.

Example 7.—Voltmeter resistance, 3,000 ohms; battery, 24 volts; second voltage, 14. What is the resistance?

Solution: $\frac{24 \times 3{,}000}{14} - 3{,}000 = 2{,}143$ ohms.

Thus we see that when a local battery is used till its voltage becomes constant—as it will do after being used a few times and remain so for several weeks—the quantity E × r is also constant, and that the only variable quantity is that of the unknown resistance, so that by working half a dozen examples any one can become familiar with the formula. If there are a large number of tests to be made it will be found convenient before beginning work to make out a table similar to the one given below, which can be worked out in a few minutes and referred to when tests are taken.

For a voltmeter reading to tenths of a volt: R = 4.5. Equivalent resistance for each degree of the scale.

Scale.	Ohms (r=100)	Ohms (r=500)
0.1	4400	22000
0.2	2150	10750
0.3	1400	7000
0.4	1025	5125
0.5	800	4000
0.6	650	3250
0.7	543	2714
0.8	462.5	2312
0.9	400	2000
1.0	350	1750
1.1	309	1545
1.2	275	1375
1.3	246	1231
1.4	221	1107
1.5	200	1000
1.6	181	906
1.7	165	823
1.8	150	750
1.9	137	684
2.0	125	625
2.1	114	571
2.2	104.5	523
2.3	95	483
2.4	87.5	437.5
2.5	80	400
2.6	73	365
2.7	70	350
2.8	61	305
2.9	55	276
3.0	50	250
3.1	45	226
3.2	41	203
3.3	36	182
3.4	32	162
3.5	29	143
3.6	25	125
3.7	22	110
3.8	18.4	92
3.9	15.4	79
4.0	12.5	62½

The resistance of a voltmeter has much to do with its range when used as a galvanometer, for the higher the resistance of the instrument the higher the reading will be, as seen by the above table. The approximate resistances of the voltmeters described are as follows:

PIGNOLET.

Two-in-one (three binding posts).
0 to 5 volts, 100 ohms.
Three-in-one (four binding posts).
0 to 6 volts, 150 ohms.
0 to 130 volts, 3,000 ohms.

ATWATER KENT.

No data.

JEWELL.

0 to 5 volts, 500 ohms.
0 to 50 volts, 5,000 ohms.

TESTING INSULATION.

Provided the standard of insulation is not a high one, measurements as high as 100,000 or 150,000 ohms can easily be made with a low reading voltmeter by simply increasing the voltage.

In this case we will suppose that an electric light service of 100 to 120 volts continuous current is available and the five-volt 100-ohm instrument is used. In this case one degree of deflection is equal to 100,000 ohms, or, if 120 volts is used, one degree represents 120,000 ohms. If the voltmeter should have a higher resistance, as 150, 500 or 3,000 ohms, the value of each scale degree would be enhanced proportionally for a higher voltage. As a deflection of half a degree of the scale can be observed by watching closely, it thus becomes possible to observe double the above amounts.

The value of one degree of deflection in ohms is found by multiplying the voltage used by the value of the degree of deflection.

Thus in a five-volt scale, divided in tenths, having 500 ohms' resistance and a testing current of 100, we would have the volts multiplied by the number of scale divisions, which gives us the number of ohms' resistance for a single scale deflection, including that of the voltmeter, which must be deducted in the final calculation.

Calling the value of one scale division, therefore, a constant, if we divide this constant by the number of degrees of deflection and deduct the resistance of the voltmeter we have the value in ohms.

By this rule a 500-ohm, five-volt scale would have $500 \times 100 = 50{,}000$ ohms as the value of one volt, or $500{,}000 - 5{,}000 = 495{,}000$ as the value of one-tenth of a volt.

As a rule a condenser is considered good enough to pass inspection if its insulation reaches 100,000 ohms, although a higher insulation is, of course, desirable.

When the current is first turned on there will sometimes be a "kick" of the needle caused by the static capacity of the condenser, but if the insulation is as high as it should be the pointer will settle back in one or two seconds and there will be no further movement. Tests can be made with great rapidity, 100 condensers being tested in less than half an hour without difficulty.

It is necessary to provide against short circuits where a low scale instrument is used, as otherwise the rush of current might injure the instrument, or at least bend the pointer by throwing it violently to one side. For this purpose, contact should be made through a push button of some kind, and the first touch should be made lightly so as to instantly detect any sign of a short circuit.

CABLE TESTING.

The same tests of cable insulation can be made as in the case of condensers by using any convenient source of high voltage, opening the cable at one end and testing, first between the conductors and then each conductor separately to ground. As in condenser tests, care should be taken to provide against possible short circuits.

Fig. 3 shows how to connect a volt-ammeter to a magneto box large enough to hold three dry cells of battery and the connections to the various push buttons on the inside. Knife switches may be used instead of push buttons if desired, but the advantage in push buttons is that they cannot be left closed accidentally when they should be open, therefore the push button or strap key style of switch is to be preferred as a safety device.

TRACING CIRCUITS.

In tracing circuits through a switchboard or instrument all drops, coils, lamps or other translating devices should be first measured and their individual resistances tabulated. The resistance of each cable conductor connecting through the opposite ends or points desired should then be measured. A short circuit indicates that there are no devices of any kind in the circuit between two points, while a falling off of the voltage indicates that a resistance of some kind is looped into that particular conductor. By referring to the tests already made it is possible to indicate with a reasonable degree of certainty just what drop or other device causes this falling off, and by following the conductors from point to point it becomes possible to map out an entire switchboard circuit without the necessity of disconnecting a single conductor.

TELEPHONE ASSISTS TRAIN.

Passengers and trainmen on the Rock Island "Rocky Mountain Limited" were indebted recently to the use of a farmer's telephone for their arrival in Davenport, although they were an hour and a half later than the schedule time. About two miles east of Ladora on the Rock Island the through train was the victim of an accident which would have compelled a long wait had it not been for the encroachment of modern science in the form of a rural telephone route through the aid of which assistance was summoned and the train brought to the division terminal with a loss of very little time.

A part of the engine's mechanism broke and the huge locomotive refused to pull any further. The train men were desperate, but could do nothing to remedy the evil until Conductor Nicholas dropped off from the rear platform and surveyed the situation. He arrived at the conclusion that the only thing to be done was to walk back to Ladora, where he could telegraph to Marengo for an extra engine and thus get to Rock Island, the terminal of the division. He was about to begin his trip back to the station when upon passing a farmer's residence he espied a set of telephone wires connected therewith, and upon inquiring learned that he could gain the desired connection with Ladora by the use of the rural telephone. At once making use of the lucky find he gave instruction to the agent at Ladora, who in turn wired to the master mechanic at Marengo, who immediately sent the desired assistance.

In addition to the very valuable assistance which has been rendered to automobilists, who, by reason of breakdowns on country roads are compelled to do their best to get back to the city, it will be seen that the rural telephone has entered upon a new score of usefulness, that of placing belated trains in a position to make up their lost time.

TELEPHONE CALL FOR MR. SMITH.

It was only an innocent telephone message, but it created a commotion resembling a football rush in the lobby at the Great Northern hotel, Chicago, recently and resulted in the dislocation of a man's ankle.

"Telephone message for Mr. Smith," sang out one of the hotel pages. There was a wild scramble by no less than six men, hailing from widely distant parts of the United States.

Percy Smythe, a Toronto clothing merchant, made so much haste that he slipped on the tiled floor and twisted his ankle. At the same time Henry C. Schmidt, of Philadelphia, was disentangling himself from a bronze statue of St. George and the dragon, where he had been hurled by George M. Smith, of New Orleans.

John Smith, of Kalamazoo, Mich., and James W. Smith, of Corning, N. Y., rushed from the grill room and tumbled over the recumbent form of the page, who had fallen over the Toronto clothing man. Paul Smyth, of Galveston, Tex., rushed up with the exclamation:

"That's a call from my wife, whom I left in Springfield."

When the gathering of Smiths had been pulled apart and apologies exchanged and "Buttons" had been lifted to his feet and told "not to mind," a man who had been an amused spectator, sauntered up from the cigar stand. He took the memorandum from the hand of the boy.

"The message is for me. I am Jarvis Smith, of Butte, Mont. If you'll wait a minute I'll answer the telephone and then I'll be glad to drink to our better acquaintance."

"We'll wait," said the Smiths, in chorus.—Chicago Tribune.

Municipal Telephones*

Stockholm is sometimes called the best telephoned city in the world because of the large number of telephones in use as compared with the number of inhabitants. At the present time, there is about one telephone to eight people, or 40,000 instruments and 300,000 inhabitants. Telephones have been made in Sweden since the early days of the industry, and because the patents restricted their manufacture here, the Swedish make has found its way to every known country of the globe. In Sweden and Norway the long distance telephone lines are owned by the government, which also controls the railroads and telegraph. In Stockholm and immediate vicinity, the older company, called the Almanna or General Telephone Company, is still in existence and has, by far, the largest number of telephones in use in its own field. The Riks, or Government telephone system, operates the long distance lines from Stockholm throughout Sweden and Norway, and also the exchanges in all other cities; but in Stockholm and vicinity it has very many less instruments in use than the Almanna.

In some of the other countries in Europe, notably Germany and France, the exchanges and long distance lines are entirely in the hands of the government, and only the telephones made in each country can be sold for use in that country; as a result, some of the telephones appear very strange to the foreigner, for instance in Germany, the instruments are about the same size as the ordinary telephones, and with the ordinary transmitter, but the receivers are of an enormous size, nearly as large as saucers and fully covering the ear. They are much heavier than our receivers, weighing two or three times as much, and each telephone has two receivers. Service in Germany is very bad, as can be imagined when two receivers are supplied for each telephone, which, in this country, would be considered entirely unnecessary. In order to be understood, one has frequently to shout and even then it is with difficulty that the conversation is carried on, especially at a distance. It is not uncommon in the smaller places to have the advice given you: "Take a cab, as it will save time and be so much more satisfactory than telephoning."

In France, a foreigner, in using the telephone, is very apt to wonder where the transmitter is and to look about for it. The telephone box is made very much like our ordinary instrument and has a small wooden shelf, such as we use for a paper pad, on which to make a note of the conversation. Strangers sometimes suppose that the shelf is for such a purpose, but strange to say, it forms the diaphram of the transmitter, and in talking, one talks right against the wooden shelf. Notwithstanding this peculiarity, the telephones in France give very fair service and have only one receiver.

In speaking of municipal telephones, it is only possible to refer to certain countries, as Great Britain and her colonies, Russia and Holland. Besides France and Germany, the governments control the telephone lines in Austria, Belgium, Greece, Switzerland and far-away Japan. In South America the telephone lines are practically all owned by private companies, and the same is true of Mexico. In the United States there have been no municipal telephone plants installed, although one was proposed by the officials of one of our cities, but later the project was taken up by the citizens of the place and a stock company formed. The nearest approach to a municipal plant at the present time is the co-operative company in Grand Rapids, Wisconsin, which put in metallic circuit and gives excellent service. No stock is sold except to renters, and only one $50 share per telephone, each subscriber being entitled to one share of stock for each telephone rented. The rates are $12 a year for residence, and $27 a year for business telephones. The stock pays dividends of one per cent a month, thus reducing the actual cost to the co-operators. The place has 4,500 inhabitants and there were 434 exchange lines in operation at the last report.

In the year 1899, Parliament empowered the municipalities of Great Britain to give telephone service under license from the postoffice. Among the first to embrace the opportunity thus offered was Glasgow, which began to give service in March, 1901, to 1,500 subscribers, the rates being $26.25 per annum, flat, or $17.50 per annum and in addition two cents for each outgoing call. The growth of this exchange has been rapid and there are now over 8,000 subscribers within and without the city. The wires are placed underground in the center of the city, with aerial cables and bare wires used elsewhere. The cost was about $150 per subscriber's line, including a large number of spare wires, provided in anticipation of a large increase in the number of subscribers. The service is said to be satisfactory, and the municipality has to compete with the older company, which is the only private telephone company in Great Britain.

A royalty of 10 per cent of the gross receipts must be paid to the postoffice by the private company and the municipalities alike, and all telephone licenses are made to expire in 1911. The long distance lines are controlled by the postoffice, which connects with the local exchanges to give their subscribers long distance service.

The Island of Guernsey, with 40,000 inhabitants and an area of twenty-four square miles, has the oldest English municipal telephone system and gives service to over 1,100 subscribers. Beginning with a flat rate of $27.75 per annum, it was found possible to reduce it to $24.50, yet with satisfactory results financially and otherwise. The cost was approximately $90 per subscriber line.

The Tunbridge Wells Corporation equipped an exchange and gave service for almost two years in competition with the private company, selling out to the latter at a profit and securing a reduction in the rates formerly charged. It was claimed that the exchange was a financial success and that the sale was contrary to public policy, but the sale was confirmed by the authorities.

Portsmouth, a town of nearly 200,000, began to give service through its municipal telephone system last December and its 1,240 subscribers' lines cost approximately $105 each. The rate is $29.30 per annum and it is said that orders are coming in rapidly. Other towns preparing to give service, or with exchanges in process of construction, are Hull, Brighton and Swansea, with Manchester and others considering the matter.

In Durban, South Africa, a town of 40,000 inhabitants, the municipality bought out the old company a year or two ago, and proposed to install a new up-to-date system, but no particulars are at hand at present.

In St. Petersburg, Russia, the system which was formerly operated by the International Bell, was taken over by the municipality in 1901. The rate charged by the Bell was $127.50 per annum, whereas the new rate charged by the municipality is $29.50 per annum. The installation is not

*A Paper by J. F. Hemenway, read before the convention of the League of American Municipalities at Baltimore.

metallic circuit. The service was and is very bad. When the old system was taken over from the Bell company, there were 4,500 subscribers, and owing to the reduced rates, there has been a large demand for connections from new subscribers. The outside construction is good, and it is proposed to install a new system with all the wires underground, and full metallic circuit for each subscriber, no party lines being allowed, as this is called for in the franchise. This new underground system must be completed in 1905, and it is intended to build for 40,000 subscribers' capacity, and to have the latest improved common battery system. The government has built two copper circuit trunk lines between Moscow and St. Petersburg, which are operated by the St. Petersburg municipality, giving connections with Moscow, at the very reasonable charge of 25 cents for three minutes' conversation. The peculiar character of the service in all Russian towns is, that it is impossible to give private service or to guarantee secrecy, as the police officials may listen at all times and to any conversation, and may use what they hear against the user of the telephone. Also, if they choose, they can, at any time, order the service to any subscriber discontinued.

Amsterdam, Holland, has one of the oldest municipal systems, and is a city of 550,000 inhabitants. The municipality has conducted the telephone business for more than seven years, and at the present time has about 5,000 subscribers, using about 6,000 instruments. The investment here is about $180 per subscriber line, and the wires are partially underground. A prospective subscriber must pay, at the time of signing the contract, what is called an entrance fee, of $10, and later the annual subscription, which is between $36 and $37 per year for unlimited service. The interurban lines are owned and controlled by the government, and for toll service, a charge is made according to the distance, of from 25 to 50 cents for three minutes' conversation. The expenses of the municipal plant at Amsterdam average about $26 per annum per subscriber. The income per subscriber is about $43.70, the net profit going to the reserve fund and for renewals, etc.

Rotterdam, a city of 350,000 inhabitants, also has a municipal system, and began to give service at about the same time as Amsterdam. There are 3,000 subscribers, using about 4,000 instruments, and the wires are placed partly underground. The cost was about $525,000. The entrance fee is $8.25 per subscriber, and the rates are, for business, $36.75; for residence, $27 per annum for unlimited service.

Several smaller towns in Holland also have municipal systems, but these have been in operation for a shorter time. At Arnheim, a town of 58,000 inhabitants, with nearly 1,000 subscribers, the rate is $18.50 per annum. Maastricht, a town of 35,000 inhabitants, has 350 subscribers and the charges are: entrance fee, $5; annual charge, $18.50. In all cases, an additional charge is made for out-of-town connections, and if the subscriber lives beyond municipal limits an additional charge is made for installing, the amount varying with the distance. This may be one fixed charge, or it may be an additional annual charge.

The full facts and figures from these systems are so mixed with other municipal items that the real results are hard to ascertain. That some will be greater successes than others there can be no doubt, as a telephone exchange, like any other business, must be conducted on business principles in order to succeed, and if the income is too small and expenses too large either the one must increase or the other decrease to succeed.

To show what is possible in the way of cheap service the Helsingfors' Telephone Association, in Helsingfors, Finland, is an excellent illustration. The place has 80,000 inhabitants and the telephone subscribers number 4,145. At the beginning, service by the Association was given in competition with the older company, but in 1901 it bought out the latter and connected the subscribers with its own central exchange. The annual rate for the subscribers is $30, but a member of the Association pays the cost of his line and instrument, $36, and an annual sum agreed upon at the meeting of the members, which, for 1903, is $12. Any subscriber has the choice of becoming a member or continuing to pay the regular subscription rate. For the year 1902, the average expense per subscriber was $13.25 and the average income $16.70, making a net profit of 4 per cent. on a capital of $368,000.

Extremely low toll charges are made in Denmark and in Sweden, varying from two cents to eight cents for three minutes' conversation, according to the distance. These rates are the same for subscribers and non-subscribers.

With regard to the cost of a telephone plant, the following estimates, taken from a careful comparison of estimates by others and from actual experience, are submitted:

An exchange of 500 to 600 subscribers, metallic circuit, aerial cable and bare iron wire, about $65 to $80 per instrument installed, including central office equipment.

An exchange of 2,000 numbers, metallic circuit, partly underground cable, aerial cable and bare iron wire, $100 to $125 per instrument installed, including central office equipment.

An exchange of 5,000 numbers, metallic circuit, underground cable in the business section of the city, aerial cable and bare iron wire, about $185 to $225 per instrument installed, including central office equipment, the larger or smaller cost depending upon the local conditions.

In neither case are included long distance, toll or farmers' lines.

From this it will be seen that, as the plant enlarges, the cost increases somewhat out of proportion, and this is due to the longer distance from the central office, larger area covered and the greater cost of equipment and installation.

In a large exchange, the cost for repairs and re-equipment will be out of proportion to a small exchange, because the instruments and central office equipment are used more, are not so carefully handled and outside construction is more liable to injury in a city than in a small town. The decrease in cost in a large exchange over a small one is per connection or per message, which is less, but the cost for service per instrument is greater because of the larger number of subscribers and therefore of the average daily connections.

Going one step further, it is estimated that the cost for operating exchanges of the capacity indicated would be about as follows:

A 600 subscriber exchange, the cost for maintenance will be about $3 per subscriber, and the expense will amount to about $6 per subscriber line, making a total average of $9 per subscriber line, per annum.

For an exchange of 2,000 subscribers installed, the maintenance will approximate $5 per subscriber line and the other expenses about $7, making a total of $12 average cost per subscriber line, per annum.

For an exchange of 5,000 subscribers installed the maintenance will be about $7 per subscriber line, and the other expenses about $8, making a total of $15 per subscriber line, per annum.

This does not include interest on the invested capital or depreciation. The depreciation according to the American practice is about seven and one-half per cent, but experts in England estimates the depreciation at only from five to six per cent. It is probable that five per cent of the cost of a plant, at compound interest of not less than five per cent, kept as a sinking fund year by year, would fully cover depreciation in a well equipped system.

It is self-evident that the cost for maintenance will be less for a new plant for the first few years, than later; and the estimates given are intended for an average covering a number of years.

No one will question that good equipment is of prime

importance and will prove most economical in keeping down both the cost for maintenance and expenses.

Unfortunately the experience of the Independents in this country does not go back many years; there have been very few exchanges in operation for a longer period than five years, and the oldest not back of 1895 or '96.

The competition of the Independents has been of great advantage in reducing rates and improving the service. A comparison of old rates charged by the monopoly in four cities and new rates by Independents, will prove this.

In Philadelphia, the Bell rates before the Indenpendents came in were: for a business place, $160; residence, $130. In the same place, rates made by the Independents are: for a business place, $80; residence, $48.

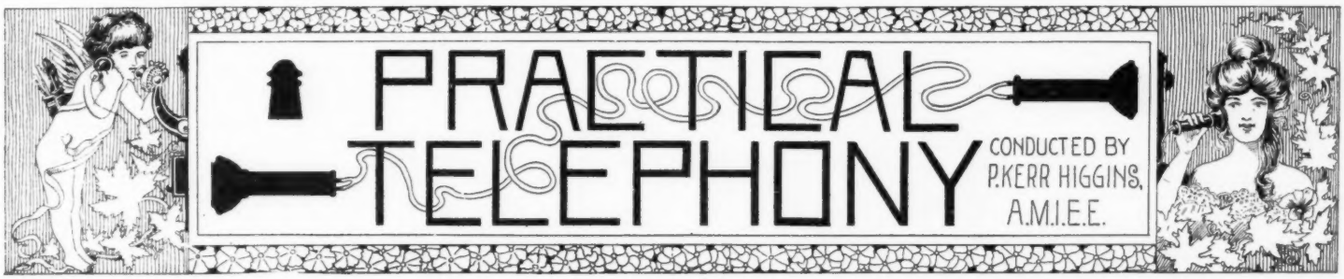
In St. Louis, the Bell rates before the Independents came in were: for a business place, $120; residence, $60. The rates made by the Independents are: $60 for a business place and $36 for residence.

In Indianapolis, the rates before the Independents came in were: $72 for a business place, $48 for residence. The rates made by the Independents are: $40 for a business place and $24 for residence.

In Rochester, the Bell rates before the Independents came in were $125 for a business place and $64 for residence. The rates made by the Independents are: $48 for a business place, and $24 for residence. From this it will be seen that the rates made by the Independents average less than half the rates formerly made by the Bell.

It is said that two companies in a city makes duplication necessary, or that many business houses are obliged to have both telephones. The result of competition by the Independents has been a reduction in the rates by the Bell, and if the two cost not too much more than the one did, and, if the number of subscribers that can be reached on the two is larger than before, the advantage is with the business house, because of the larger number of customers within its reach. Again, with the two telephones there is the advantage of using both at one time, which is frequently necessary and always convenient. Besides, if one line is busy, time can be saved by using the other instead of waiting.

Measured service is the means of reducing the average number of calls per subscriber and increasing the revenue. It makes every message pay and reduces the deadhead calls. It is better for the owner of the exchange rather than for the subscriber. Measured service is selling retail. Unlimited service is selling wholesale.



ARTICLE 13.

The auxiliary equipment provided for an exchange should be as simple as possible. The chief operator's desk should be equipped for one or two positions and have facilities for receiving special calls from the main board. It should be equipped to supervise any connection at will and should also be able to supervise the information desk and monitor's

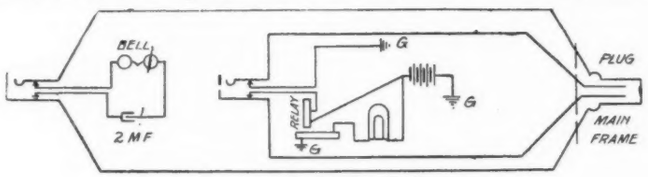


FIG. 1.

desk. There should be an assembly and dismissal bell for the shift of the operators, and a signal for the switchboard department. Compartments should be provided for all records. In small and medium sized exchanges the traffic report should be compiled at the chief operator's desk.

The monitor's desk usually has two positions and is most

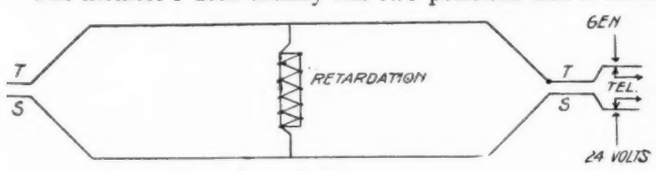


FIG. 2.

complicated. This is made necessary because of the large amount of wiring to provide proper supervision of all the operator's positions. Each pilot lamp is duplicated on this desk, so that the operator in charge may be able to supervise the incoming calls of each position and the clearing out signals. Provision is also made so that without interference the monitor can go in on any operator's circuit and supervise her work and conversation. Service taps (Fig. 2) when connected to a subscriber's line at the distributing rack, permits supervision of the connection when made to that line. The supervision of the subscriber's connection is shown in this figure. This service is found very convenient and necessary. The method of the supervision of the operator's pilot lamps is shown in Fig. 3.

The supervision of the operator is usually accomplished by running a pair of wires from the supervisory jack at the monitor to a tertiary winding on the induction coil of the operator's set, and the monitor has provided for the supervision an ordinary head receiver with cord and plug attached.

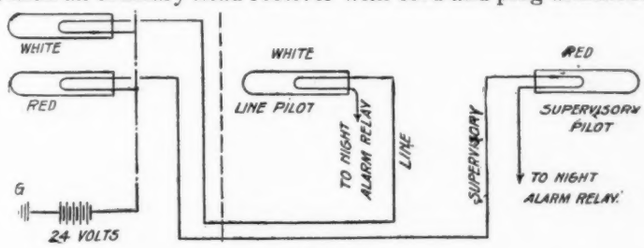


FIG. 3.

By inserting this plug in the supervisory jack she can connect her receiver with any position at will. This arrangement is made so as to have no transmitter or battery in the circuit to pick up the noises in the room. With this method the operator is not aware that she is being supervised. Another arrangement is sometimes used where a button is provided for shunting the transmitter and using the regular cords.

A record should be kept of slow or careless operators, and turned over to the chief operator for attention. The maker of this record should have no authority to take any operator to task for inefficiency. She should simply report the facts, noting the time and position. This is an important position,

and the most competent operator possible should be placed in charge, and one who is without prejudice.

The information desk is provided to relieve the regular operators and concentrate all requests for information at one central point. With this end in view, this desk should be provided with all information of any character likely to be asked for by subscribers. This desk, for exchanges up to 5,000 telephones, should have two positions, each operator being assigned five single cords and five trunks. All city directories should be accorded a place on this desk, and a daily list of all new lines cut into service and all changes of numbers and addresses should be supplied.

The wire chief's desk is usually equipped for the testing of lines. In cases of trouble a voltmeter is necessary for each position. Five trunks for incoming calls should be provided, and ten lines should be reserved subject to the wire chief's order. These may be lines his trouble men are working on, or they may be lines he wishes to watch for intermittent trouble. He should be provided with order circuit keys so that he can cut in on the telephone circuit of the break-down or hospital position. It is very necessary that his trunks be connected at the extreme end of the multiple, so that tests made by him embrace the complete circuit, including all the multiple jacks. In Fig. 1 is shown the cord circuit of the wire chief's desk.

Fig. 4 shows testing trunks to main distribution frame. In most systems this set of trunks is unnecessary, but where a permanent ground is maintained on the tip or sleeve, these will be found not only convenient but necessary. Fig. 5 shows the circuit of the testing cords, including all the keys and voltmeter connections.

In order to obtain the best results with voltmeter tests, it is necessary to gather data from all the local conditions existing. This may be accomplished by reading with tip grounded; with sleeve grounded; full battery; open circuit; line in good working order; receiver on and off the hook and so on. In this way the data may be tabulated and held for reference. By adopting this method, it will greatly reduce the work of the desk. A large percentage of trouble reported is really not trouble at all, and careful and systematic testing is therefore absolutely necessary.

No trouble should be turned over to the trouble man unless it actually exists, and then it should be sifted out and assigned to the proper department. The necessity of having a first-class man as wire chief is apparent.

In conjunction with the wire chief's desk is the complaint

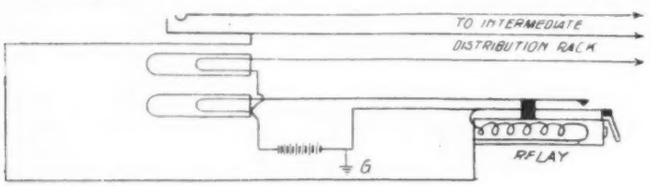


FIG. 4.

department, it being understood and advertised that all complaints be concentrated to this one point. This is very necessary in order that the responsibility may be located and that complaints made will reach their destination at once. The wire chief also keeps a record showing all trouble reported during each day.

Another form is usually kept by the wire chief informing him where his trouble men are, and what trouble man was at a given subscriber's station on a given date. This information is frequently called for. Such a report should show the amount of work done by each trouble man, and the daily average for a month usually determines his usefulness. It is customary to divide up the town or city into districts and assign a trouble man to each. Following this practice, it is then his duty not only to clear up the trouble in that district but, as occasion presents itself, to make inspections. He should also be required to use and develop his observation faculty so that nothing may be passed or overlooked which is likely to cause trouble in the near future.

Still another record is usually considered an auxiliary of the wire chief's department, known as the cable record. This record should be made as simple as possible and should only be arranged to meet the prevailing local conditions. Where multiple cables are used it will be necessary to make a record to meet the peculiar distribution. This record should be carefully and faithfully kept. The cable record should be in the form of a flexible book permitting new leaves to be added as desired or old ones changed. A record of all the intermediate cross-connections is also necessary. This is also in book form and indexed. A record should be provided for

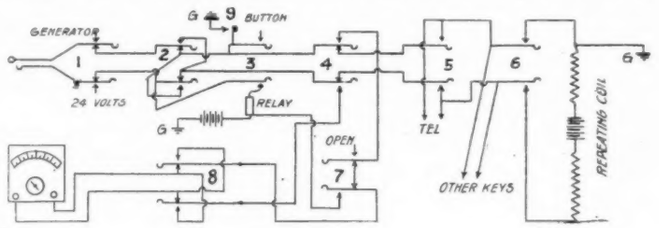


FIG. 5.

battery reading, where storage battery is used. One charging is taken every day, or every week, as may be desired. This test is usually taken in conjunction with, and forms part of the peg count. This is found to be convenient as a check on the operators and should fluctuate in proportion to the rise and fall of the peak of the load of the exchange.

Records are absolutely necessary, but unless they are filled out carefully and in detail, properly filed and signed, they might as well be dispensed with. The lack of care in keeping them properly is the cause of frequent misunderstandings, and reference to properly kept records will often satisfy a complaining subscriber as nothing else will. Their importance as a part of the exchange equipment is therefore easily seen.

The first annual convention of the National Arm, Pin and Bracket Association was held on the evening of November 10 at the Lookout Mountain Inn, Chattanooga, Tenn.

The president being absent, Secretary J. B. Magers took the chair. The plan to regulate a uniform base on which to work and standardize the goods manufactured, was discussed, which took the greater part of the evening after which the association adjourned to meet the next day at 11 o'clock. This session was called to order with E. J. Noblett in the chair. The first matter of importance was the election of officers for the ensuing year. The election resulted as follows: President, C. H. Houston, Chattanooga, Tenn.; vice president, Daniel Ravenel, Franklin, N. C.; secretary, J. B. Magers, Madison, Ind.; treasurer, R. L. McQuat, Indianapolis, Ind.

Next in order was the appointing of the following executive committee by the president: E. J. Noblett, Chicago, Ill.; A. A. Towers, Ellijay, Ga.; A. W. Bruner, Paoli, Ind. The balance of the committee is to be appointed later by the president.

It was decided the next convention was to be held in St. Louis, Missouri, in July, 1904.

The executive committee was ordered to draft a letter to be sent to all supply dealers, stating the object of the association and requesting their co-operation in all matters pertaining to the standardizing of the articles manufactured. It was also ordered to adopt resolutions thanking the Chattanooga people for their hospitality to the members of this association.

There being no other business to come before the convention, it adjourned and took a trip over the city and Chickamauga Park.

Milo G. Kellogg's Statement.

It has been known since June last that from January, 1902, the practical control of the Kellogg Switchboard and Supply Company has been with the Bell Telephone interest. The negotiations by which I undertook to obtain the return of the control to me having now failed, and I having filed a cross-bill to the bill filed by the minority stockholders of the company in June last to cause the alleged sale to be declared void, and in support of said bill I desire to make a public statement concerning the matter.

The transaction took place while I was in California sick and incapable of attending to my affairs or of being consulted about them. It was done by Mr. DeWolf, the vice president of the company, who had general charge of the business of the company and to whom, in my absence and sickness, I had given a general power of attorney to transact any and all business connected with my personal property. He was assisted by Mr. Buckingham of Chicago, a capitalist and a director in the company. The nominal purchaser was Mr. Barton, who is president of the Western Electric Company. The money to make the payment, or some of it at least, is known to have come from the American Telephone and Telegraph Company at Boston, and there seems to be no doubt that the real purchaser of the stock was that company.

I was not aware of the transaction until July 4, 1902, six months after it occurred. At that time my health had sufficiently recovered so that I could take some interest in business matters and at my request Mr. DeWolf met me at Denver on July 4, when he first disclosed to me what he had done and the reasons therefor; to that time I had no idea whatever that such a state of affairs existed.

The facts leading up to the transaction and the reasons which induced Mr. DeWolf to make a contract of sale which was intended to include my stock and his own, and Mr. Buckingham's, amounting to more than three-quarters of the stock of the company (my holding amounting to about two-thirds of the company's stock), are substantially as follows: In the summer of 1901 I became ill and under the care of a physician, but was able to give some attention to business until about the middle of November, when I was obliged to give up all work and care and leave at once for California, to be gone for an indefinite length of time. During the last half of the year 1901 the capacity of the company for the transaction of business was practically doubled at a large outlay, part of which was met by the sale of the remaining treasury stock of the company and the remainder, to the extent of $250,000, was to be met by an increase of the capital stock, which was under way when I was obliged to leave. During the month of December it became apparent that the Everett-Moore syndicate would not be able to care for the paper which they had given the company to the amount of about $222,000, which the company had discounted and which would mature during the next two months. At this time also it was not expected that I would ever recover my health sufficiently to take up active business again. It was therefore thought best by Mr. DeWolf to make a sale of the stock, by which the funds needed by the company could be secured, while I and my estate would be relieved of the care and responsibility connected with the controlling interest in so large a business. As he knew Mr. Barton and knew no other interest which he thought could so readily advance the amount required, he met Mr. Barton on January 4, 1902, and made a contract in his own name for the sale of the stock as above. At that time he had in his control bona fide and binding subscriptions for treasury stock of the company and other quick assets and funds by which all the pressing needs of the company could be met as they matured, but for the reasons above stated he considered it advisable to make the sale.

When Mr. DeWolf explained the matter to me, I at once wrote to Judge R. S. Taylor of Fort Wayne, a lawyer in whose judgment and fairness of mind I had great confidence, to meet me at Denver, so that I could explain the matter to him and obtain his advice as to what my attitude in the matter should be. We met on July 14. His opinion and advice coincided substantially with my own judgment in the matter. When he returned home he wrote me on July 21, in which he said:

> If the ownership of the stock were so readjusted that a large part of it were in your hands, and less than a majority of it in the hands of the present purchasers, and the remainder in the hands of persons whom you could both trust, I think the company would retain the good will and business of the independent people. It seems to me to be your duty to endeavor to accomplish some such result before you take a step so injurious to the purchasers as I think an immediate disclosure of the facts by you would be.
>
> You can not undertake such a work now. You seem to have experienced a wonderful recovery from a desperate condition of health. But you are not sure of your ground yet. It is too soon to risk the strain of business of such magnitude and possible complication. When once you pick it up you can not lay it down again unfinished.
>
> It therefore seems to me that for the present and for a number of weeks or months, which time alone can determine, you must necessarily let affairs run as they have been running since the sale of your stock. But at some future time, no further distant than the circumstances may make unavoidable, you must disclose to the public your real relations to the company. It is greatly to be desired that, with that disclosure, you shall announce your return to an active participation in the business upon arrangements which will secure to the purchasers of the company's appartus all the advantages and all the security which the company could have given to them if its old organization had remained unchanged.

I had in the meantime written Mr. DeWolf a letter from Colorado which was intended to be shown to Mr. Barton, and which was shown to his representative, in which, without waiving any legal rights I might have to annul the sale, I suggested a readjustment of the matter which would practically relieve it of its objectionable features. I returned to Chicago on October 1, feeling that, with the aid of Judge Taylor in the active negotiations, I was strong enough to take up the matter of the readjustment of the company along the lines which we were contemplating that I should aim for. Judge Taylor first went to Boston, about the middle of October, and had an interview with President Fish of the American Telephone and Telegraph Company, which we looked upon as the real principal in the purchase. Judge Taylor suggested to him a readjustment of the matter by which there would be a "divided ownership" of the stock, with the Bell interest in the minority or a return to me of all the stock which had been purchased, at a reasonable profit on the transaction. Mr. Fish said that he would take the matter under advisement and would consult Mr. Barton on the subject. Judge Taylor also saw Mr. Barton early in November and on November 9 he wrote Mr. Fish as follows: "I assume, of course, that the present holders will be guided by considerations of profit in the transaction, but there seem to me to be certain conditions which must be recognized by both:

(1) It is impossible to maintain the present status permanently or very long.

(2) With the true ownership of the property disclosed, the opportunity for profitable business will be at an end.

(3) A resale of the entire stock at a fair profit would be an easy solution from the present holder, and is probably possible.

(4) A continuation of profitable business is probably possible upon a joint ownership, with 40 per cent or some such proportion of the stock remaining in the hands of the present holder.

On November 26 Mr. Fish wrote Judge Taylor that the "divided ownership" plan was impracticable, and advised him to continue the negotiations with Mr. Barton. Judge Taylor then met Mr. Barton in Chicago, and after conferences during three days made him a proposition in my name for the repurchase by me of all the stock which had been bought, on terms which were satisfactory to Mr. Barton, providing any resale at all would be made. This proposition was made December 2, and Mr. Barton said he would take it under advisement and give an answer as soon as possible. On December 25 he announced that it had been determnied not to make a resale at all. He also said that an increase in the price offered would not make any difference. The price which was offered afforded about one hundred thousand dollars profit on the transaction, and in addition my offer contained valuable concessions concerning foreign business which Mr. Barton desired to have made.

To this point our negotiations had been based entirely on what we considered would be elements of profits to the Bell interest. On December 26 I wrote a letter to Mr. Barton and sent a copy of the same to Mr. Fish, in which I said, among other things along the same line:

> The thing which I feel most keenly about, as far as I am concerned, and the thing which the public, and especially the contract customers of the company, which have been obtained since the purchase, will object to, is the conduct of the business since the purchase. There was a plan which apparently originated at the time of the purchase, and which was carried out by the management of the company and by yourself since then to conceal the sale by me and the purchase by you from the public and from the customers of the company, and thereby obtain for the company much valuable business which could not otherwise have been obtained. * * * As I have indicated above, it has been made to appear that I, and not your company, was the principal owner of the stock of the company. Under these misleading appearances the business of the company during the last year, amounting to over $1,500,000, has been obtained. * * * What I regret as far as I am concerned is not the same purchase of the stock, but the fact that the use of my name and personality was entered upon and continued as it was. * * * At the present time it will not satisfy the customers who have this year made multiple switchboard contracts, to have assurances from you, however strong they may be, to the effect that the contracts which have been made with them will be strictly lived up to in the future. They have entered into a business which is in competition with companies which are controlled in ownership by the company which controls you and your company. They have more than five million dollars in investment and securities and more than 25,000 customers, and many more which are in prospect, providing their business goes along and is not interrupted by patent litigation or otherwise. If there is any possibility, however remote, that they will not be treated in entire good faith, it will create a doubt as to the investment which will affect the market value of the securities and have an effect on the number of subscribers which can be obtained. It will be felt that they are at the mercy of their commercial enemies. * * * I am aware that when the arrangement was made last January, and the course which I have explained was entered upon, it was done hastily and without due consideration as to what was involved along the lines which I have indicated. I also apprehend that it has not been fully appreciated by you at the present time. * * * The customers of the last year have every right to expect and to demand that they be placed substantially in the position they expected, and were assured that they were in with respect to the Kellogg Company when they made their contracts. My own name having been used, as it has been, without my knowledge or consent, I have a just right to ask, as I do, that I be placed in the position of ownership which has been assigned to me with the public during the last year, on fair, reasonable and equitable terms. I believe that the terms which I proposed to you through Judge Taylor were in themselves considered fair and reasonable. * * * I have written in no spirit of criticism or fault finding, but to present as strongly as I know how the embarrassments to you and to me and to Mr. DeWolf which will necessarily attend the disclosure to the public of what has been done. Nothing that any of us can do or say, short of a resale to me, will disarm the resentments and suspicions which are bound to follow. A repurchase by me will remove them entirely and at once. I am willing to make that purchase on terms that will return a handsome profit to you on your investment. I hope that you have not made up your mind so irrevocably that you can not reconsider the subject along the lines of repurchase which I have suggested, and that you will yet conclude to accept my offer.

I also said in my letter to Mr. Barton: "I know of other instances where, in the line of the policy you inaugurated last January (1902), the public and the customers have been led to believe that I was the principal owner in the company. I have tried to prevent this to the best of my ability, without taking any overt action or position while our negotiations have been pending which would prevent them coming to a favorable termination. Since my return here I have kept away from the customers of the company as much as possible and have only met three or four of them, altogether, and then by accident. I have only been in the office of the company two or three times a week, and then only for a short time and with the object of keeping the staff together for service in case I should be able to make a repurchase, which I was aiming for. There have been no contracts made by the company since I became aware of your purchase of the stock. A considerable number were made the first half of the year, before I became aware of the purchase, and the shop has been running on them and on miscellaneous orders since my return. I have kept a close watch and should not have allowed any important work to be contracted for without the purchaser knowing the true ownership of the stock."

When, on December 27, I sent Mr. Fish a copy of my letter to Mr. Barton, I said, among other things:

> I believe that it is true, and I believe that you and your associates will agree with me in the proposition that the same rules of business conduct and conscience which individuals would apply to themselves in their relations to others should also apply to corporations, and that the representatives of these corporate interests should be governed by them in the administration of their trust to the same extent that they would were the business their own. With the business of the world going more and more into the hands of large corporate interests, any other line of action and conduct if recognized to exist and be in force would generate suspicions and lack of confidence in such corporate interests as to be ultimately detrimental to them, although there might seem to be some immediate gain in the course. It is also, I think, true that in ethics, as well as in law, the principals are in fact committed to the actions of their representatives and should be willing to make readjustments as well as to stand by the letters of their contracts.

All the facts contained in my letter to Mr. Barton were undisputed, as well as were all my premises and conclusions in my letters to Mr. Barton and Mr. Fish, except the one conclusion that the course of the business during the last year should call for a resale of the stock to me on fair and reasonable terms of purchase.

Mr. Fish answered my letter under date of December 30, in which he said:

> While agreeing absolutely with you in your proposition that corporations should act in the same good faith in business relations as that which is required in the care of individuals, I am unable to see in the situation as stated in your letter any controlling reason why the stock of the Kellogg Switchboard and Supply Company should be resold to you.

Of the business of the company during the year 1902 (which amounted to over $1,500,000 in manufactured product) substantially one-half was for telephone sets complete, to the number of 75,000 or thereabouts, which contained transmitters of the kind which the Bell Company has claimed infringed its Berliner patent; and of the remaining half of the business of the year fully two-thirds was for common battery switchboard apparatus of a kind which the Bell Company claims infringes its common battery patents, and on which it has begun suits against certain customers of the company. It has been the opinion of the patent counsel of the company and of its patent experts and of myself that the appartus does not infringe such patents and that some of them are invalid and void. I advanced this claim of the Bell interest with respect of their patents as a reason why it should be to their interest to make a return of the stock to me. In a letter which I wrote to Judge Taylor on this sub-

ject and which he gave to Mr. Fish and a copy of which I sent to Mr. Barton, I said:

I think that there can be no question but what, when the Kellogg Company sells such apparatus, with the ownership of the stock as it is and the Bell Company practically directing the management of the company and participating in the profits from the sales, the purchaser would have secured the right to use the apparatus under the Bell patents to the extent that the courts would not interfere with its use; in other words, the purchasers would have obtained practically a license from the Bell Company to use the apparatus.

The position which they have asumed, and which they propose to continue in the management affects their business in several ways, some of which I will indicate.

In the first place, the Bell Company has previously given others than these customers of the Kellogg Company the exclusive right to use its patents in the territories where these customers are using the apparatus, and to do and to assume a position which also granted to these customers of the Kellogg Company the right to use apparatus covered by its patents would be for the Bell Company to act in contravention to the exclusive rights previously given to its licensees.

In the sales of the Kellogg Company the transmitters are included on the basis of $1.75 or thereabouts, and the receivers on the basis of $1.35 or thereabouts. If I am not mistaken, the Bell Company leases the same instruments to its regular licensees at an annual rental which is greater than the above prices at which the Kellogg Company has been selling them during the last year, under conditions which really amount to a license under the Bell patents. Under such sales, which establishes a standard value, including the right to use, I think that the regular licensees of the Bell Company would be entitled to object to the rentals which they are paying on the ground that they are unconscionable.

Another difficulty which I think will meet the Bell Company when the facts are known is that it will practically show to the world that the company places very little value on its patents, and capital which may at the present time be possibly deterred from entering into competition with the Bell interests on account of the patents will no longer have any fear of them.

Soon after the Bell interests became practically in control of the Kellogg Company, several suits were brought by that interest against several of the customers of the Kellogg Company for infringement of patents, although the Kellogg Company had given rigid guarantees of protection for the apparatus against all claims for patent infringement. One of the guarantees, as a sample, reads as follows:

The Kellogg Company hereby agrees to warrant and defend unto the telephone company, its successors and assigns, that the switchboard and all the appurtenances and attachments thereto hereby agreed to be delivered do not infringe any patents granted and in force and valid. Should such switchboard, apparatus or appliance, or any part thereof, be challenged by suit as an infringement of any such patent by any person or corporation whatsoever, then said Kellogg Company shall at its own cost and expense defend such suit and pay any damages which may be assessed against said telephone company, its successors or assigns, by reason of any such alleged infringement or loss or damage to its business caused thereby.

I wrote a letter to Judge Taylor on December 30, while he was in Boston, in which I called attention to these suits and to the guarantees of the Kellogg Company, and also to a decision by Judge Atcheson concerning what is known as the Millheim case, brought by the Western Electric Company under the Carty patent; and I asked Judge Taylor to bring my letter to the attention of Mr. Fish, which he did, and I also sent a copy of it to Mr. Barton. In my letter I said:

In the case we now have under consideration the Bell Company, owning now more than three-quarters of the stock of the Kellogg Company and being under contract to take the rest of the stock of the company, if offered within a certain time, has begun several suits against the users of the apparatus of the Kellogg Company. If the suits were against the Kellogg Company itself, the two parties to the suit would be in essence identical, and there could be no claim or question raised to the effect that there was a "real controversy" between the parties. The suits are against the *users* of the apparatus which the Kellogg Company made, and the apparatus was sold to them under rigid guarantee against infringement.

As the Kellogg Company is bound to live up fully to these guarantees whosoever owns its stock, and as the Bell Company is now practically the owner thereof and the company has guaranteed to make good all the damages which may be assessed against the telephone company for infringement of patents or from loss or damage to their business caused thereby, there no doubt is and can be no real controversy between the Bell Company and the telephone company in respect to the suits; and I can see no reason why they do not come under the class which Judge Atcheson said would not have been heard or decided had the facts been brought to the attention of the court.

I brought up these matters concerning patents as reasons why the pretended sale should be rescinded and the Bell interest should make a return of the stock to me and thereby relieve itself of the manifest difficulties connected with the ownership of the stock, as far as the patents were concerned.

Mr. Barton, on January 7, wrote me a letter, in which he again declined to make any resale of the stock, and, in answer to another letter which I wrote to him on the subject, he wrote me on January 12, and again declined to make the resale.

My counsel, Judge Taylor, being at that time dangerously ill in Boston, and being unable to offer me any advice and assistance, I at once went to St. Louis and consulted Charles Nagel, Esq., stockholder and a director in the company, and a lawyer in whose judgment I had confidence, as to what further steps I should take, and especially as to whether any legal remedy might exist. Mr. Nagel wrote me, under date of January 28, a letter which I received in Florida on February 2, in which he said: "A superficial consideration leads me to the impression that the minority stockholders possibly have a remedy, particularly if they invoke the aid of representatives of the state in proceedings to prevent the formation of unlawful combinations. This is a broad subject, calling for the closest examination."

On February 4, however, I again wrote to Mr. Barton, inclosing a copy of Mr. Nagle's letter, and also called his attention to the fact that certain directors and employes of the company who had occupied their positions duriug the last year with the understanding that I owned the controlling interest in the company, had been placed in what they would consider an embarrassing position; and I suggested that this was an additional reason why the return of the stock should be made in order to place them in the position before the public which they understood that they were occupying when they accepted their positions.

Immediately after the receipt of Mr. Nagel's letter I began to consider the form in which I should make the announcement of the transaction to the public and began the preparation of it, and on February 7 I wrote to Chicago with the view of fixing upon an early date for the announcement, there having been an understanding by Judge Taylor with Mr. Barton and Mr. Fish that neither party should announce the condition of affairs to the public without giving notice to the other party. My attention was, however, called by an officer of the company to the fact that a disclosure of it at that time would probably greatly injure, if not jeopardize, the whole investment of two of the largest customers of the company which had been obtained since the Bell interest obtained the control of the company, as their plants had not been fully completed. At the same time a suggestion was made by Mr. DeWolf to Mr. Barton and myself that an arrangement might be made between us by which the company would continue in business as strictly a manufacturing proposition, with myself as the president and the owner of a part of the stock of the company, and that Judge Taylor should take up negotiations to that end as soon as the condition of his health would permit him to do so. I consented that such negotiations should be taken up to see what would result from them, and for that reason, and on account of the suggestion that the plants of two of the principal customers, as above stated, were still in an unfinished state, I decided to delay for a short time the public announcement which I was then preparing to make.

The negotiations which Judge Taylor then took up with Mr. Barton finally failed, largely because Mr. Barton would not consent to two conditions which we made, and which

were embodied in a letter which Judge Taylor wrote him on April 29, 1903, as follows:

It appears to me that there ought to be an express disclosure of the real party in interest—the beneficial owner in your purchase of the Kellogg Company's stock, and in the purchase from the St. Louis parties, and that there ought to be, as part of the transaction in closing it up, a contract to the effect that the policy of the Kellogg Company shall be to conduct a straight manufacturing business for profit to itself and for the benefit of its customers, and that this policy is not to be subordinated to any interest of the Bell Company or its allies or customers.

While these negotiations were pending, the true condition of affairs and all the information which I could give was confided to some of the minority stockholders of the company, and the most careful consideration possible was given to the subject in their interest by some of the best legal talent of Chicago, and it was the opinion of the counsel that the minority stockholders, through the medium of a bill in equity, might obtain a decree of court which should declare that the sale of my stock to the Bell interest was an unlawful injury to the rights of the minority stockholders and in restraint of trade, and, therefore, illegal and void. A bill in equity to that end was therefore filed by some of the minority stockholders in June last, to which I was made a defendant. My negotiations with the Bell interest having failed, and my own counsel, in view of all the circumstances, being of the opinion that as to myself the alleged sale of my stock might, upon my application, be held void and I restored to my former position of ownership and control, I have now to that end filed a cross-bill to their case. The case will be conducted with great care and with the utmost vigor, and all the counsel express the opinion and I myself am confident that its final determination will be to reinstate me in my former position of ownership and control in the Kellogg Company. It is expected that the case will be argued on demurrer within a short time.

From the time of the bringing of the suit by the minority stockholders of the Kellogg Company in June last, the preparation for hearing of the patent suits brought by the Bell interest against the customers of that company has been suspended at the instance of the representatives of the Bell interests which brought the suits.

November 2, 1903. MILO G. KELLOGG.

How to Connect Up Two Local Metallic Subscribers' Lines with a Metallic Toll Line without a Switchboard

WILLIAM H. HYDE

The above may be accomplished by the use of four jack-switches as shown in Fig. 1.

DIRECTIONS.

(1) To connect toll line with local subscriber on jack-switch number two:
Push in the plunger of jack-switch number one.

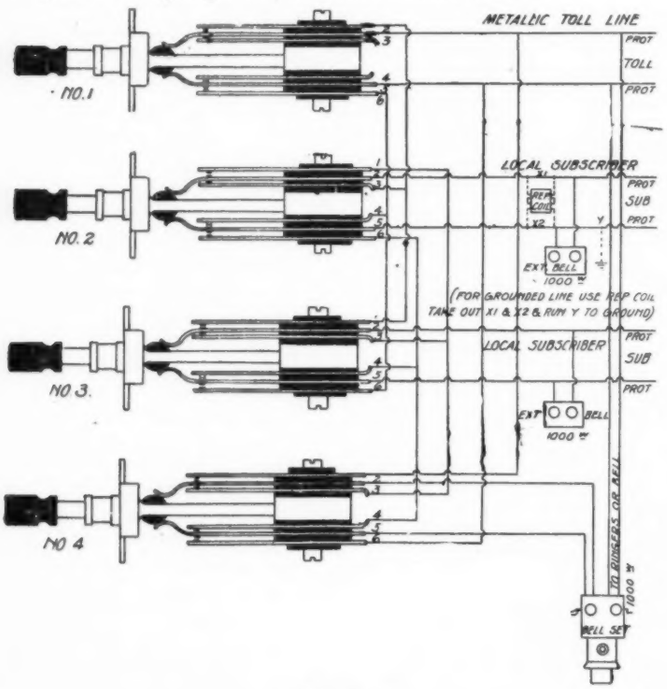


FIG. I.

(2) To connect toll line with local subscriber on jack-switch number three:
Push in the plungers of jack-switches one, two and three.
(3) To connect the toll station instrument with the toll line:
Push in the plunger of jack-switch number four only.
(4) To call the local subscriber on jack-switch number two:
Push in the plungers of jack-switches two and three.
(5) To call the local subscriber on jack-switch number three:
Pull all the plungers out.
(6) To connect the two local subscribers together:
Push in the plunger of jack-switch number two only.

By referring to the diagram the connections of the different circuits will be easily understood.

The toll line is run from the protectors to numbers two and five of jack-switch number one and to numbers one and six of jack-switch number four.

The two local subscribers' lines are run from the protectors to numbers two and five of jack-switches two and three respectively.

The ringers of the toll station instrument are run out to separate binding posts, to avoid using an additional extension bell, and are bridged permanently across the toll line, as shown in the diagram; the generator and talking circuit of the toll station instrument is connected with numbers two and five of jack-switch number four.

Numbers one and six of jack-switch number one are connected with numbers three and four of jack-switch number two and numbers one and six of jack-switch number three.

Numbers one and six of jack-switch number two are connected with numbers three and four of jack-switches three and four.

Extension bells are bridged across the two local subscribers' lines as shown in the diagram.

Both the extension bells and the bell used on the toll station instrument must be of the high wound or bridging pattern.

If one of the local subscriber's lines should happen to be a grounded line, a repeating coil must be introduced in the circuit as shown connected in the diagram in the local subscriber's circuit connected with jack-switch number two.

To connect the local subscriber on jack-switch number two with the toll line, the plunger of number one jack-switch is pushed in, this connects the springs two and five that are connected to the toll line with springs one and six. As the springs one and six of jack-switch number one connect with springs three and four of jack-switch number two, that make contact with the springs two and five, of jack-switch number two, when the plunger is pulled out.

To connect the local subscriber on jack-switch number three with the toll line, plungers of jack-switches one, two and three are pushed in. Pushing in the plungers of jack-

switches one and three, connect two and five and one and six of jack-switch number one, with one and six and two and five, of jack-switch number three, that are connected to the local subscriber's line. It is necessary to have the plunger of jack-switch number two pushed in to disconnect the local subscriber on this jack-switch.

To connect the toll station instrument with the toll line, the plunger of jack-switch number four only is pushed in. Pushing in the plunger of jack-switch number four connects two and five with one and six, which establishes a connection between the toll station instrument and the toll line. The toll agent can also "listen in" on either of the subscribers when they are connected with the toll line, by pushing in plunger of jack-switch number four.

To call the local subscriber on jack-switch number two without disturbing the toll line, plungers of jack-switches two and three are pushed in. Pushing in plunger of jack-switch number two connects numbers two and five with numbers one and six that connect with numbers three and four of jack-switch number four, which make contact with numbers two and five that connect with the toll station instrument when the plunger is out. Plunger of jack-switch number three is pushed in to cut off the local subscriber on this jack-switch.

To call the local subscriber on jack-switch number three without disturbing the toll line, all the plungers of the four jack-switches must be pulled out. These four jack-switches should be mounted in a neat box and placed alongside of the toll station instrument. By referring to the diagram it will be seen that when the plungers are all out, a connection is established between the toll station instrument and the local subscriber on jack-switch number three, via numbers two and five, and numbers three and four of jack-switch number four, and numbers three and four and numbers two and five of jack-switch number three.

To connect the two local subscribers together, only the plunger of jack-switch number two is pushed in. This connects the local subscriber on jack-switch number two with the local subscriber on jack-switch number three, via numbers two and five and numbers one and six, and numbers three and four and numbers two and five of jack-switch number three. This connection also permits the toll station to "listen in" to the conversation.

NEBRASKA INDEPENDENT TOLL LINE MEETING

Representatives of Nebraska Independent telephone companies to the number of about thirty met in Fremont on November 10, for the purpose of forming a closer union of interests as a working basis for toll business.

The meeting was called some days ago by Manager Crist and President Courtright of the Fremont Telephone Company and the response was greater than expected. Most of the delegates came on the morning trains and were cordially greeted by the manager and officers of the local company. They proceeded to the central office where all interested themselves for an hour inspecting the exchange and forming acquaintances.

At 11 o'clock carryalls were provided and under the guidance of Manager Crist, Assistant Manager Pond, President Courtright and Secretary Henry of the local company, the delegates were driven about the city until the noon hour when all went to a hotel for dinner.

At 1 p. m. the meeting convened at the headquarters of the local company. The meeting was called to order by W. J. Courtright. I. D. Clarke was selected as chairman. Howard Heine was chosen secretary.

W. D. Crist, manager of the home company, explained the object of the meeting. It was, he said, to organize for promoting the volume and quality of toll service between the various Independent companies. He submitted a draft of a proposed constitution which embodied his ideas of the plan upon which to proceed. It provided for the usual officers, with the principal one to be an auditor, who would check up weekly all calls of each company and send a weekly statement to each; also for an inspector who would see that uniform equipments for toll service be installed by all exchanges. The association would be known as the Nebraska Toll Line Association.

Mr. Killarney of Auburn said he thought the question of adopting rates between neighboring companies should be left to the companies themselves.

Mr. Munn of Nebraska City was called upon to explain the purpose and plan of the Southeastern association. He did so at some length. He said the proposed organization was practically covered in its field by the Southeastern, though it would probably have to be enlarged in some of its features to be suited to the larger field.

Mr. Pollock of Plattsmouth said he thought the standardization of equipment for service would be a practical and essential thing. He believed a clearing house should be established to equalize rates and distribute the toll receipts. At present there is none. He thought the Southwestern company could extend its sphere of usefulness.

Mr. Courtright thought it best to have an organization that would cover an adjustment between two or between three or more companies. The Southeastern had too many objects, a company for regulating purely toll business be organized—a federation of interests. To bring the matter regularly before the meeting he moved that a toll association be organized.

Mr. White of Wahoo thought good toll service was highly essential for competing with the old company. He favored a toll association, to govern rates and their distribution.

Mr. Killarney of Auburn agreed that there should be system and co-operation. He didn't see why control between companies should be surrendered to another company.

Mr. Crist thought the relations between companies could be adjusted later.

Mr. Everett of Colombus said his company had as yet no outside connection, but he would be ready to join at the right time.

The question of organizing was then put and carried without a dissenting vote.

Mr. Thorp then moved that the association be called the Nebraska Independent Toll Line Association. The motion was carried.

It was moved and carried that the association deal with toll business of two or more companies except as otherwise agreed by two companies.

Mr. Courtright moved that a committee of three be appointed to select a list of committees which was carried. The chairman named Mr. Crist of Fremont, Mr. Pollock of Plattsmouth and Mr. White of Wahoo.

The constitution and by-laws of the company just organized was signed by representatives from the following towns: Fremont, Hooper, Arlington, Herman, Blair, Colombus, Nebraska City, Lincoln, Plattsmouth, Papillion, Valley.

The committee selected on officers presented its report which was adopted and the following were elected:

President, I. D. Clark, Papillion.

Secretary, J. Howard Heine, Hooper.

Auditor and treasurer, W. D. Crist, Fremont.

Rate committee: A. M. Munn, Nebraska City; O. M. Thorp, Wahoo; T. H. Pollock, Plattsmouth; J. C. Killarney, Auburn; A. E. Gantt, Falls City.

Membership: W. C. Walton, Blair; A. R. Dodson, Valley; Clarence Vail, Arlington.

It was moved that the officers put the association on a working basis as soon as possible and report to the members as soon as completed.

There was considerable discussion on the time when the amended constitution and by-laws should be adopted. The matter will come up at the annual meeting in January.

Telephony.

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TELEPHONY IN 1904.

The readers of this publication need no promise for the year to come. As TELEPHONY enters upon its fourth year and seventh volume, they may have every assurance that the high standard of excellence which has characterized it from the beginning will be maintained. The scope, strength, quality and peculiar advantages of the periodical have won for it enduring prestige. It has become the recognized national authority in matters pertaining to Independent telephony in its many and varied branches. It will be our continued purpose to slight none of the industries represented. Naturally there are always certain underlying principles that can be safely relied upon in planning a future, but there are no hard and fast rules upon which one can unerringly depend and be sure. TELEPHONY has not been built on promises or prospects, however, and it will continue, as it has in the past, to be the *only Independent telephone journal* in all that the words imply. TELEPHONY *is not subsidized.* Its highest duty is to its subscribers, whose opinions it seeks to influence. No one is permitted to control or dictate its editorial policy, except when acting as a part of the movement to benefit the industry in the broadest sense.

TELEPHONY prints in each issue more pertinent telephone reading matter than can be found in a single issue of all other telephone and electrical journals combined. It prints more telephone advertising in a single issue than can be found in a single issue of all other telephone journals. It charges the highest price for its advertising and does not resort to "padding." No other telephone or electrical journal will make this statement. The reason TELEPHONY prints so much advertising at the highest rate is that it has the largest telephone circulation and commands the confidence and respect of every man engaged in telephone work. The publication stands on its past records as an earnest of what may be expected for the future. Let any man who doubts TELEPHONY'S position in the telephone field read the present issue from cover to cover and he will see why TELEPHONY stands alone. Telephone manufacturers who advertise in its columns do so because the publication is fair and fearless and has by far the largest Independent telephone circulation of any publication in the world. As against the petty spleen of would-be competitors TELEPHONY stands like the Rock of Gibraltar, the bulwark of Independent telephony.

The greatest writers in the world on telephone subjects will contribute to its columns. The twelve issues for this year, of which this one is the last, will make a bound volume of nearly 2,000 pages. It is an historical record of the year's progress written by such authorities as U. S. Alderman, W. Aitken, R. B. Abbott, W. C. Boyer, F. W. Bingham, Chas. L. Burlingham, Joseph B. Baker, C. F. Bennett, George M. Bandy, E. M. Coleman, W. H. Crumb, Edward E. Clement, Carl C. Curtis, A. E. Dobbs, H. M. Deavitt, F. Dagger, W. W. Dean, F. A. Demerest, H. C. Fyfe, J. M. Fuller, G. W. Graves, S. P. Grace, P. Kerr Higgins, C. O. Harris, William J. Hammer, W. H. Hyde, G. W. Hand, B. G. Hubbell, H. S. Herr, A. L. Hutchinson, C. E. Hull, George D. Jackson, J. C. Kelsey, P. M. Lincoln, S. J. Larned, W. F. Laubach, J. W. Layne, Thomas D. Lockwood, Kempster B. Miller, George Muir, S. G. McMean, A. H. McMillan, F. L. Martin, J. J. Nate, F. M. Potter, Henry W. Pope, J. D. Powers, Arthur Pickford, H. C. Raney, D. A. Reynolds, M. L. Robeson, H. H. Robinson, H. E. Ralston, L. W. Stanton, R. A. L. Snyder, H. D. Stroud, J. V. L. Turner, Jas. M. Thomas, C. E. Tarte, W. A. Taylor, F. A. Wegner, J. G. Wray, B. F. Wasson and many others. To enumerate all of the contributors to its pages would be equivalent to calling the roll of the world's most noted writers on every branch of the telephonic art.

MR. KELLOGG'S STATEMENT.

TELEPHONY, as an Independent telephone paper, has felt it to be its duty to make mention in its editorial columns of the fact that the Kellogg Switchboard and Supply Company is a Bell concern, and as such is not entitled to the patronage or support of any Independent.

In taking this attitude we have been prompted by one object only—the fulfilling of what we regard as our duty as an Independent paper. We have had no personal grievance against the Kellogg Switchboard and Supply Company, nor against any one connected with its management. Our attitude has been upon the broad basis which an Independent journal must maintain toward manufacturing companies operating under the control of the Bell Telephone Company.

We have stated and repeat that the operation of the Kellogg Switchboard and Supply Company is for the sole purpose of creating discord among Independents; that it is impossible, or practically so, that the company should ever become anything but a Bell concern in the future, and we have predicted for the company the inevitable fate which we feel certain must follow as a result of its ownership by Bell interests.

In the present issue will be found a statement made by Milo G. Kellogg, personally, which we believe should be read by every subscriber of TELEPHONY. It is to be presumed, since this statement is made by Mr. Milo G. Kellogg himself, that it contains every possible argument in favor of Mr. Kellogg's present contention with regard to his future control of the Kellogg Company. It undoubtedly presents, in the most favorable light, the Kellogg Switchboard and Supply Company situation from Mr. Milo G. Kellogg's own standpoint. It is, therefore, the more convincing evidence of the truth of TELEPHONY'S statements regarding the Kellogg Company since, in every detail, this statement now issued by Mr. Kellogg substantiates every claim made by TELEPHONY with regard to the Kellogg Switchboard and Supply Company.

To quote Mr. Kellogg's own words with regard to the purchase of the company: "The money to make the payments, or some of it at least, is known to have come from the American Telephone and Telegraph Company at Boston, and there seems to be no doubt that the real purchaser of the stock was that company."

The ownership of the stock has not been changed materially since the purchase was first made, and it is therefore confessed by Mr. Kellogg himself that the stock is owned at the present time by the American Telephone and Telegraph Company. Moreover in the same statement Mr. Kellogg in so many words states that the control of the stock of the company by the Bell interests forfeits any claim which the company has upon Independent patronage.

Allowing this to be so, we do not see how Mr. Kellogg hopes to regain control of his former property without a long drawn out legal fight. As Mr. Fish, president of the American Telephone and Telegraph Company, in a letter to Mr. Kellogg under date of December 30 last, says:

"While agreeing absolutely with you in your proposition that corporations should act in the same good faith in business relations as that which is required in the care of individuals, I am unable to see in the situation as stated in your letter any controlling reason why the stock of the Kellogg Switchboard and Supply Company should be resold to you."

It appears that during the progress of Mr. Kellogg's negotiations for a repurchase of this stock Mr. Kellogg proposed, as one of the remedies to be adopted, that the Bell company should continue as a minority stockholder in the corporation, but granting to him the control. Mr. Kellogg's statement also goes into the question of patent litigation and into the question of relations between the manufacturing company and operating company, bearing out in every detail TELEPHONY'S editorial statement as to the situation and its inevitable results.

TELEPHONY has no desire in connection with the Kellogg Company matter to be anything but perfectly fair to every one interested, but Mr. Kellogg's own statement, if anything were wanting to furnish additional proof, would fully justify us in maintaining the attitude which we have maintained consistently from the time when this matter was first made public, of denunciation of the Kellogg Switchboard and Supply Company as a Bell concern not entitled to the confidence or support of Independents in any Independent enterprise.

FOOD FOR THOUGHT.

"Are our telephone periodicals sufficiently careful as to the business relations sustained by contributors?"

No, dearly beloved in the faith that permeates all true Independents, our telephone periodicals are not sufficiently careful, and often a lamentable carelessness is shown in the character of the contributions admitted to their pages, and then reprinted in circular form for distribution by our genial friends the enemy, whose scalping knife is never allowed to grow dull.

Take the *American Telephone Journal,* for instance, as a shining example of the old saying that the Bell depends entirely on the Independents to spread its gospel. For therein we find hundreds of columns of the pernicious doctrines so repugnant to all true Independents, yet paraded week after week in a journal claiming to be Independent in spirit and policy, to be published for Independents, by Independents, to promote the cause of Independents.

And bear in mind, beloved brethren, that if its editorial views and comments are true, then the whole theory and practice of Independent telephony is wrong, and the principles promulgated by the Bell are the only practical and profitable principles to hold.

From the beginning of the Independent movement flat rates have prevailed and are the rule among Independents, and low flat rates at that. But here is the opinion of the *American Telephone Journal*:

"A low flat rate is dangerously unprofitable and even accompanied by the greatest skill in administration must eventually be swamped by the increased amount of service demanded by the average customer. . . . "

"The flat rate for telephone systems of any size is wrong in principle and fatal in application. . . . The flat rate is unnatural and incorrect; it is feeble, erroneous and illogical; it is deceptive and unjust to the subscriber and dangerous to the telephone manager."

"However, we had better once for all consider flat rates as put out of court for city telephone systems. Their day has undoubtedly gone by, and it is plain to any observer of telephone affairs that, if high enough to be profitable, flat rates repress the development of the telephone to a point immensely below the well demonstrated possibilities of that development, and, if fixed low enough to permit of a fair development, they soon become hopelessly unprofitable. Apparently, however, it will require nothing short of bitter experience to convince many telephone managers of the fundamental unsoundness of flat rates for telephone service on a large scale. Almost the only defense left for them nowadays is the archaic theory that it is better to operate a small system at a profit than a large system at a loss. That is an obvious proposition. It is certainly better to operate a small business at a profit than to try to run a large business from which you must necessarily fail to make a profit. But in the case of the telephone service the world will not let you run a small system and pocket your snug profit. It has lately been shown what the telephone service can do in a large city, and the people have awakened, to a certain extent, to its possibilities. They now demand a large system, reaching everywhere and available to everybody. Your small system will be no good to the majority, and it will soon be no good to you, because some one will come along with a system run on lines that will permit indefinite development, and the small system will grow gradually and beautifully less. In short, the city telephone system of to-day and of the future must be capable of unlimited development, and the flat rate is not a developer. If it is high it scares away the public, and if it is low it soon scares that most timid object, capital, by failing to produce the dividends that capital requires wherewith to cloak its timidity. So enough of flat rates."

Dearly beloved of the faith, did you realize that you and your friends have been putting up good money to tell capital that

"Your small system will be no good to the majority, and it will soon be no good to you, because some one will come along with a system run on lines that will permit indefinite development, and the small system will grow gradually and beautifully less."

What a desirable doctrine for an Independent publication to promulgate broadcast, and who can describe the feelings that fail to voice themselves when an Independent having one of those "small systems" finds capital amply supplied with excerpts from the *American Telephone Journal?*

"As during the last few years the public has begun thoroughly to acquire the telephone habit, and there is daily evidence that the telephone habit is continuously spreading wider and taking a deeper hold, a great natural force has been set in motion which the flat rate manager will be powerless to stem or to evade, which will inevitably swamp him in due time, while it will simply make steadily and increasingly for the prosperity of the message-rate manager."

What admirable encouragement this *American Telephone Journal* offers to capital seeking investments in the Independent field. "In due time" the very "force" that built up a great industry is going to swamp it.

Again what a splendid opportunity is here offered to make plain to capital what the true character is of that "great natural force," and how the Independents set it in motion! Did the editor take advantage of it? Not on your life. That is not what he draws his salary for. Not much. Saturated with Bell ideas, this Bell editor of an alleged Independent journal thus explains why greater progress was not made by Bell exchanges prior to the inception of the Independent movement.

"The early telephone exchanges were very crude affairs and gave a very crude and imperfect service, judged by the standards of today. The telephone itself was perhaps the most complete and perfect invention that has ever been produced, with the possible exception of the Lucifer match. But to give the telephone its present-day usefulness and to realize its almost unlimited possibilities consider the innumerable appliances with which it has had to be surrounded. To begin with, without the battery transmitter the telephone would be about as useful for practical purposes as the phonograph is today, and the phonograph was invented almost at the same time as the telephone. Even with the battery transmitter the telephone would have but an insignificant field but for the switchboard, and *until the multiple principle was invented the switchboard was as crude a device as the horse car compared to the electric train.* And when you come to the multiple switchboard you open up a vista of a never-ending series, an ever-widening stream of inventions, devices and improvements that go to make up the telephone system of today, but which have taken time, trial, money, effort and experience to produce."

There are thousands of Independent exchanges in successful operation to-day without a multiple switchboard.

The Bell is not operating an automatic system. Thus we have the opinion of the *American Telephone Journal's* editorial writer "as to the limited possibilities of automatic exchanges."

"The automatic telephone exchange, of which several have been invented in this country, but only one has attained the smallest degree of practical use, has been trying for years to get a footing in Europe. Several years ago demonstrations of the working of an American automatic exchange were made in a number of European cities, but all that resulted in the way of practical work, was an experimental exchange of 400 stations in Berlin, equipped to show the German officials the capabilities of the system. In Europe, as in this country, the conditions of the telephone business have grown away from any possibility of a purely automatic exchange coping satisfactorily with the work. Consequently automatic switchboards have made even less headway there than they have here, as no real business has been done in them, while on this side of the water there are several automatic exchanges actually working. Every telephone man knows, however, that there is no such future for the automatic exchange as its advocates claim for it and that every day the practical conditions of the telephone business become more complicated, and less promising from the automatic point of view."

Commenting on Mr. Raphael's lecture, delivered in London, the editor of *Lightning* said:

"The truth is, of course, that the Bell organization, firmly intrenched in the large cities, and in possession of the long distance lines, holds a strategical position from which nothing can ever drive them. Unfettered competition has resulted in popularizing the telephone in a marvelous manner in the country districts of America among a class of people that in Europe or Great Britain never think of using it."

And here is the comment that the *American Telephone Journal* makes after reprinting the foregoing:

"Which remarks go to show that *Lightning* is an attentive reader of the American Telephone Journal, and notes the signs of the telephone times in this country. This is far more than can be said of those European telephonists or writers on telephony who are heard at all in the press."

This must be interesting news to Independents in St. Louis, St. Paul, Utica, Philadelphia, Indianapolis, Cleveland, Toledo, Columbus, Pittsburg, Buffalo, Baltimore and many other cities. Do these cities form "the country districts of America"? And if "the Bell organization holds a strategical position from which nothing can ever drive them," what is to become of the capital invested in the Independent field? Or do the Independent exchanges exist only in imagination? And is the wonderful Independent telephone development of cities of medium size only a pipe dream?

Again, in its comments on the report of the Glasgow telephone exchange built to compete with the National (Bell) Telephone Company, the editor of the *American Telephone Journal* clearly shows where his sympathies lie.

"The *Review* has certainly put its finger on a weak spot here, and it will be interesting to see whether more "complete statistics" will be forthcoming, so that the true facts may be arrived at. Some further comments are made on the operating expenses, which are brought out on an unduly low figure at Glasgow; it is pointed out that there has been no charge made *at all for depreciation and that expenditures which ought to be charged to expense are being charged to capital.* These points are clearly brought out in the special report of the official auditors. A long editorial article in *Engineering* is also devoted to a scathing criticism of the Glasgow telephone accounts, and of the action of the Council in adopting the accounts, notwithstanding the analysis made of them by several Councillors, who insisted that the surplus of $10,000 was purely imaginary and would be converted into a loss of much larger amount if the accounts were correctly stated. The opinions of *Engineering* on the subject are practically contained in this paragraph: "One councillor who supported the committee was simple enough to give away the whole case in one sentence. He agreed that a larger sum would have to be provided, but they were not going to provide it by throttling the concern. That truthful remark let the cat out of the bag. *If proper payments were made to depreciation and sinking fund the telephone rates would have to be increased. An increase of these rates would mean the loss of present clients and the withdrawal of many applications now before the department.* There would, therefore, be a serious check to progress—nay, there might even be a 'throttling' of the concern. Depreciation must, therefore, wait till circumstances permit of its being openly recognized, if that day should ever come. This is an old dodge, practiced a few years ago in Glasgow by the Electricity Committee and now handed on to this new department."

When it was proposed to build a municipal plant in Hull, England, to compete with the Bell, did the *American Telephone Journal* join hands to down the common enemy? Not much! That is not what the assistant to the general manager is paid for doing. Listen to the character of the encouragement he gives to those who are bravely fighting the Bell:

"The *Electrician* points out that the prospects of the Hull enterprise are by no means rosy. The license runs only to 1911, when the Post Office may buy only a portion of the plant. The company's plant at Hull is central battery and gives an efficient service; the municipality proposes to put in a cheap plant and to allow only two and a half per cent for depreciation. Taking all these matters into consideration, the *Electrician* writer thinks that the Corporation of Hull is hardly well advised in seeking to put in a competing telephone service in Hull, if there remains any possibility of its making reasonable terms with the National Telephone Co. The case would appear to be one in which the purchase of the company's Hull undertaking by the Corporation would have been the most reasonable solution of the difficulty, for the Corporation was certainly in a position to make good terms for itself. Now, if, as is probable, the Local Government Board inspector decides that the opposition to the scheme by the small but influential body of rich ratepayers who are against it, is not sufficient reason to refuse the loan, we shall have, of necessity, a large waste of public money. The Corporation will doubtless make its telephone service pay—on paper—until 1911, when it will be found that the depreciation has been

far greater than at the rate of two and a half per cent per annum, and also a large part of the loan will still remain to be paid off, as the money will be lent for twenty-five years. Then, if the Post Office does not buy at the book value of the undertaking, the ratepayers will have to bear the loss; or if the Post Office decides to buy for a large price a plant that will be largely useless, the loss, of course, comes upon the taxpayer."

On the American stage certain well-known characters win our admiration by their ability as lightning-change artists. But when these changes in character directly affect our income, it's quite a different matter. Thus it may be proper for the editor of the *American Telephone Journal* to draw his pay as a salaried official of the Bell company, and yet fill the columns for his paper. But when he leaves his editorial chair and poses as an expert (and no one denies his ability) simply to condemn all that is being built up in competition to the Bell, we begin to wonder if he has not missed his true calling. Even though this testimony was given in England, the incontrovertible fact remains that it was given entirely in the interest of the National (Bell) Telephone Company, by a Bell employe and for the sole purpose of discouraging competition against the Bell. And this Bell employe is a constant and regular contributor to the *American Telephone Journal* and has written many of its editorials, similar to the following:

"Mr. Webb, who stated that besides his long experience in New York, he was qualified to speak as a telephone expert from having extensively and on several occasions inspected the principal European telephone systems, broadly condemned Mr. Bennett's report, estimates and specifications. The report gave no idea of the real nature of the telephone business which demanded constant expansion. In a few years Hull would be drawn into an expenditure of nearly a million dollars, whereas the report and estimates gave the impression that the municipality would have a complete telephone system for $240,000. The plant recommended by Mr. Bennett was obsolete and would give a poor service, while his cable specification was a most unwise one, calling as it did for eighty-four different sizes of cable, ranging from 6 to 312 pairs, all joined solidly together by numerous 4-way and 3-way joints. The working expenses were much underestimated and would provide only for an ill-organized, ill-paid and inefficient staff. Depreciation was underestimated at two and a half per cent, with a brand new plant of the best description he would not put it at less than five per cent. He thought no new telephone service should be started to-day with anything but central energy plant, which had become the standard practice. On cross-examination Mr. Webb was asked if he had not taken American figures for costs, but the reply was that he was quite familiar with English practice and had used English rates of pay, etc., in all cases."

If time and space permitted many pages could be filled with extracts from the columns of the *American Telephone Journal* showing that our telephone periodicals are not sufficiently careful as to the business relations sustained by contributors or by editors.

THE BELL LESSON OF INSECURITIES.

The sale of the Michigan Telephone Company (Bell), on November 4, to N. W. Harris of Chicago, has many peculiar features. In the first place, the public is given to understand that the Bell Telephone Company's interests have been absolutely wiped out. The sale of the Michigan Telephone Company was made for $4,100,000, which amount is just about enough to cover the face of the bonds upon which the sale was made, together with expenses and accrued interest. A representative of the American Bell Telephone Company made a bid of $4,000,000, but refused to better the price offered by Mr. Harris.

No sensible man, acquainted with the facts in connection with the financial methods of the Bell Telephone Company, will believe for a minute that for the lack of a few thousand dollars the American Bell Telephone Company would calmly and quietly submit to a net loss in excess of $5,000,000. No sensible man, either, will be willing to believe that all the facts connected with the Michigan Telephone Company sale will ever be fully known, but we hazard the guess that the minority stockholders have been effectually frozen out, and whether or not the Michigan Telephone Company in future is Bell or Independent, it is certain that the men and women who invested their savings in Michigan Telephone Company stock and were the minority stockholders in that company will lose every dollar that they so invested. Whether it is a fact that the Bell Telephone Company did back out or not, one thing is certain, common honesty demanded that the American Bell Telephone Company should protect the minority stockholders who have lost their all by reason of their placing confidence in the backing and support of the Bell Company, and either way, the situation may turn, these stockholders will lose. If the Bell Telephone Company has actually lost control of the Michigan Telephone Company, it should have provided for the men and women who have relied upon its previous statements and issues of stock, as a guarantee of good faith, and if it has not lost control of the Michigan Telephone Company, but has simply engineered a deal to foreclose on the bonds, in order to freeze out the small stockholders, the proceeding is one which can not be too strongly condemned. The future alone can tell which way the matter will eventuate, but it is to be hoped that the credulous and simple minded people of the United States who have been willing to swallow any story emanating from Bell sources will reflect a little upon the bitter pill which owners of Michigan Telephone Company stock have had to take, and that they will begin to inquire into the methods of Bell finance.

We recommend to people who have money to invest in telephone securities that they look into some good Independent telephone stock, paying steady dividends and based upon an honest capitalization of a company enjoying local support and confidence. It is better to invest your money at home than to make a present of it to strangers in Boston.

In view of this last Bell financial lesson, coupled with some other bitter lessons which have been taught to other holders of Bell stocks recently, the exceptionally fine standing of Independent securities is all the more to be remembered.

BELL INSTRUMENT OUTPUT.

The output of instruments of the American Telephone and Telegraph Company for the month and the nine months ended September 20 was:

	Month	
To September 20—	1903.	1902.
Gross output (number)	79,406	75,011
Net output (number)	45,968	31,677

For the nine months the record was:

	1903.	1902.
Gross	812,299	808,334
Net	453,398	461,645
Total outstanding	3,603,718	2,987,251

It will be seen from the above statement that for the nine months ending September 20 the net output was only 453,398, as against 461,645 for the corresponding period last year, which means the Bell company is losing ground. The total number of Bell instruments in service is 1,801,859, which constitutes the Bell work for twenty-seven years. If the Independent placed 3,000,000 in service in the ten years of their existence, how many will they have in use when they are given seventeen years longer in which to build new systems and add to those already built?

The Independent movement is of the people, for the people and by the people and its output of telephones can only be gauged by the wants of the people. It is a safe prediction that when the Independent movement is twenty-seven years old there will be no Bell.

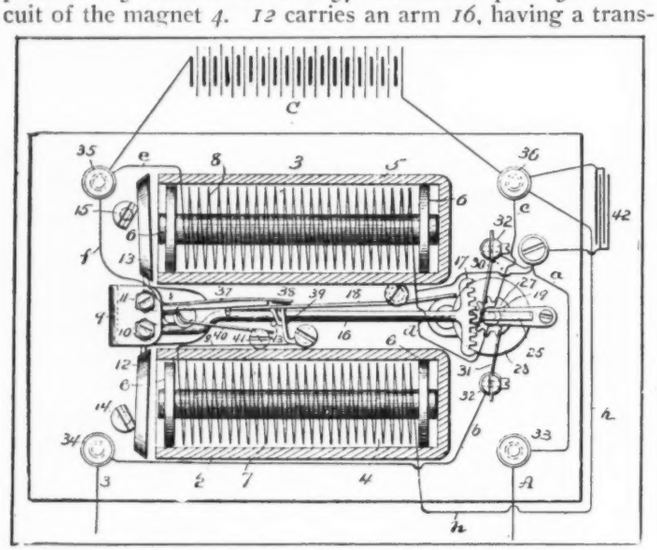
During the coming Inter-State convention make your headquarters with TELEPHONY in room 646.

DIGEST OF TELEPHONE AND KINDRED PATENTS

Information concerning any patent will be furnished without charge by addressing Edward E. Clement, Editor of this Department, McGill Building, Washington, D. C.

738,437. N. S. Harter, apparatus for changing character of electric currents.

This is quite an ingenious whirligig pole-changer, by which either alternating or pulsating current can be produced from direct. The apparatus consists essentially of two magnets *4* and *5*, mounted on a suitable base, and having between them the standard *9*, to which the armatures *12* and *13* are pivoted. *13* controls the lever *37* and contact point *38* in circuit of the magnet *4*. *12* carries an arm *16*, having a transverse rack at its extremity engaging a pinion *27* on the spindle of the commutator *19*. This is an ordinary split commutator, upon which rest the opposite brushes *30* and *31*.



738,437—APPARATUS FOR CHANGING CHARACTER OF ELECTRIC CURRENTS.

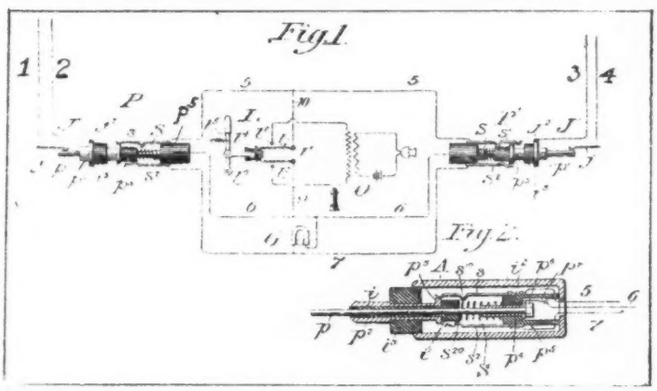
35 and *36* are the battery posts, and from the latter to the commutator the condenser *42* is connected to prevent "sparking." *33* and *34* are the line-posts.

The magnet *5* being permanently connected in series with the commutator through wires *d-e*, pulls up its armature as soon as the battery circuit is closed, thereby closing spring *38* on point *39* and bridging the magnet *4* across the battery circuit. The latter then pulls up its armature *12*, swings the arm *16*, turns the commutator to reverse the current, and breaks the contact at *38-39* by means of pin *43*. This breaks the circuit at magnet *4* until the arm *16* is swung back by spring *18*, when the operation is repeated, and so on, as long as the battery circuit is closed.

This apparatus is not complicated, and its operation should prove quite interesting, as it is ingenious.

741,713—Spencer B. Prentiss, circuits and apparatus for telephone switchboards.

This constitutes an improvement over the mechanical self-restoring drop and jack installed in many small exchanges by the American Electric Telephone Company. On most if not all the switchboards in these exchanges the calling generator wire is carried to contacts in all the jacks, and the plugs have spring sleeves. When a plug is pushed into the jack as far as it will go the generator springs in the jack are connected to line, and when pressure is removed from the plug its spring sleeve pushes it out to normal position. In operation Mr. Prentiss' system is identical with the American system; that is, when a plug is inserted in a jack and pushed in as far as it will go, calling generator is put to line. The difference is this: Mr. Prentiss desires to dispense with the generator connections in the line jacks and substitute cord connections therefor without using ringing keys. He therefore provides spring switches in the plugs, which serve as ringing keys. In the drawings herewith, Fig. 1 is a diagram of a pair of line jacks connected through a cord circuit according to this invention, and Fig. 2 is a section of a plug. In Fig. 1 *1-2* and *3-4* are line wires coming into the central station and terminating respectively, at the jacks *J* and *J1*. No annunciators are shown. The plug *P* is shown in jack *J*, its top *p1* being in contact with spring *j1*, and its sleeve *p2* in contact with the sleeve *j2*. As shown in Fig. 2, the plug has a tubular handle *A*, with a pole in its rear end for the passage of the cord, and supported within and upon it a hollow base *p5* of insulating material, carrying two contact springs *s1* and *s2*, the former normally in contact with the shoulder *p3* on the sleeve contact *p2*, and the latter (*s2*) adapted to make contact therewith when the handle of the plug is pushed forward over the front shoulder block *i3*. The tip *p1* and sleeve *p2*, with interposed insulation *i*, are solidly mounted in the block *i3*, and the tip spindle passes back through the top *i2* of the hollow base *p5*, having a coiled spring *S* surrounding it between the shoulder *i1* and the block *i2*. It will be noted from the diagram



741,713—CIRCUITS AND APPARATUS FOR TELEPHONE SWICHBOARDS.

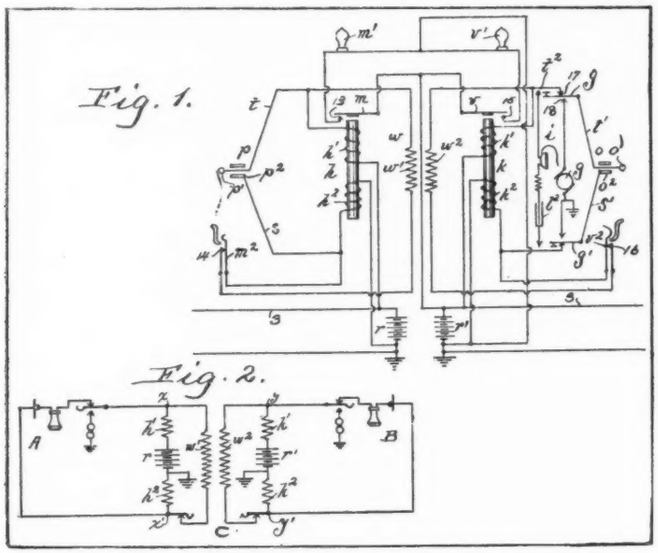
that there are three conductors in the cord, *5* and *6* being the ordinary talking conductors, and *7* the ringing generator wire. The generator *G* is connected on one side permanently to the conductor *6* of every cord, and on the other side to the conductor *7* thereof. In the diagram the plug handles are removed, but the operation will be apparent upon inspection of the contacts. Pressure upon the handle *A* carries forward the base *p5*, and with it the springs *s1* and *s2*, until the latter touches the shoulder *p3*, the former being disconnected therefrom. The generator is then to line through conductors *6* and *7*.

A listening key is shown in this system, and the plugs

both arranged so as to be able to ring both ways. The principal point of inquiry which occurs to me is what effect the permanent connection of the generator to the talking conductors *6* of all the cords will have. The invention is of course applicable to very small exchanges.

741,807—K. B. Miller, central energy telephone system.

This is an improvement over the previously patented systems designed by Mr. Miller for the Kellogg Switchboard and Supply Company. The invention consists in the insertion of a plug seat switch in place of a condenser in the form of circuit shown in Fig. 2, herewith. Such a circuit with a condenser is referred to as being described in another case filed February 4, 1901. Referring to Fig. 2, *A* and *B* are two subscribers' stations, with their lines connected through the cord circuits of a central station *C*. In the cord circuit is the usual bridged repeating coil, having its windings *w1* and *w2* connected to the respective lines. Instead of putting a battery in the bridge, making it common to both coils and both circuits, as the Bell people do, or interposing two batteries between the divided halves of the two coils, thereby putting each battery in series in one circuit, as the Kellogg Company has done, Mr. Miller bridges his



741,807—CENTRAL ENERGY TELEPHONE SYSTEM.

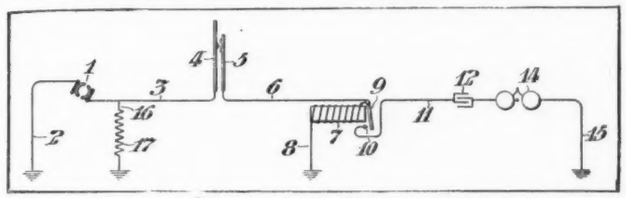
two batteries between the points *x-x1* and *y-y1* of the two circuits. The effect of this is to provide two paths for current from each battery. Thus from battery *r* current may flow around through the coil *w1*, and may also flow out to the subscriber's station and back when the subscriber's hook is up. Although nothing is said about it in the specification, it would appear that the resistance of the coil *w1* should be high compared with that of the sub-station apparatus and line. In any case, however, as both the battery and repeating coil are connected to the cord circuit, there would be a certain amount of leakage at all times through the coil, which should be prevented when the cords are idle. In the former case, as stated, a condenser was interposed in the coil circuit, and in the present case a switch is interposed at the point *x1* or *y1* for the same purpose, which is held open by the corresponding plug when idle.

The windings *h1-h2* and *k1-k2*, in Fig. 2, are those of supervisory signal relays. These are better shown in Fig. 1, which is a diagram of one cord circuit. The plugs *p-o* are connected through the repeating coil *w1-w2*, each circuit being held normally open by a switch *m2* or *v2*, as stated. Bridged across each side of the cord circuit is a battery with its relay, one description sufficing for both. The relay *h* has opposed end-on windings *h1* and *h2*, between which the battery *r* is connected. The outer ends of the windings are connected across the cord *s-t*. The armature *m* controls the circuit of a lamp *m1*. Battery current flowing to line or through the repeating coil produces no effect on the relay, and voice currents in the metallic circuit are choked back entirely, inasmuch as end-on windings even when opposed present almost as high an impedence as if continuous. Consequently the relay produces no effect whatever during the use of the lines, but when a subscriber hangs up his receiver, he grounds one side of his line, and as the main battery is also grounded a single winding *h1* or *k1* takes current, and this energizes the relay to light the lamp for disconnection.

As in most of the Kellogg patents this one contains a multiplicity of claims, there being fifteen separate claims, directed to combinations of the points above mentioned.

741,847—D. F. Stakes, telephone system.

This invention is intended for use in central stations where switch-relays corresponding to the subscriber's line are grouped together and controlled by the operators to connect their respective lines with calling generator. The patentee says that heretofore the condenser discharge has been taken through ground connections of the individual relay coils, and owing to the inductance of said coils the armatures are uselessly vibrated when signaling. Such vibration is objectionable because it lessens the effect of the current for ringing, pits the relay contacts by sparking, and makes an incessant chattering noise in the relay room. The object of the invention is to provide a better path for the condenser discharge than that through the relays. This is



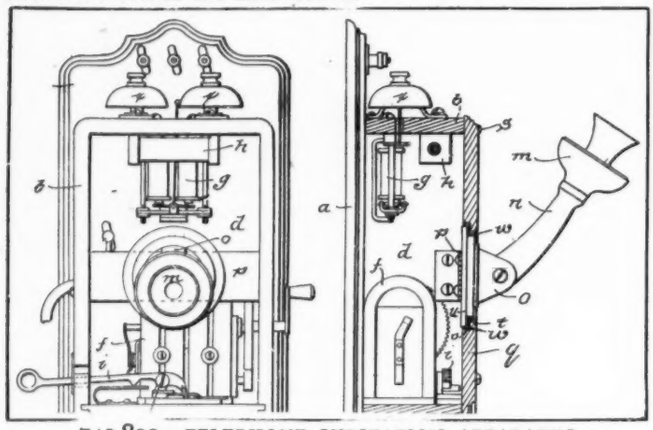
741,847—TELEPHONE SYSTEM.

shown as a shunt of the main circuit between the generator and the relays, containing a high non-inductive resistance, preferably higher than the resistance of a relay coil. The arrangement is simple, as shown in the accompanying figure, wherein *1* is a pulsating current generator, grounded at *2*, and adapted to be connected through the switch *4-5* to the relay *7* and ground at *8*; and thence by wire *10* through the bell *14* at the subscriber's station. The discharge shunt is shown at *16-17* between the generator *1* and the relay *7*. The idea is that for ordinary ringing current the ohmic resistance prevents serious interference by the shunt, and insures small loss of current, but for the condenser discharge and relay windings *7* choke it back on wires *6-5-4-3* and shunt *16-17* to ground. This patent is assigned to the Keystone Company of Philadelphia, and has nine combination claims.

741,899—H. F. Farwell, telephone sub-station apparatus.

This apparatus has been advertised for some time by the Country Home Telephone Manufacturing Company, of Chicago. The general arrangement is the same as in the so-called "cabinet" set which has been advertised by Stromberg and the American Electric Company, or the so-called "compact" set of Kellogg. The difference is in this, that while all of these have hinged fronts carrying the transmitter, the present invention contemplates the attachment of the transmitter to an inside support, letting it stick out through a hole in the front, which is put on with screws. This permits the transmitter connection to be made solid, without any flexible cord or hinged joints. In the cut herewith, the left hand figure is a front view with the cover off, while the right hand figure is a section showing the cover on. It will

be observed that the transmitter arm base *O* is carried on a bridge *p*. On page 34 of TELEPHONY for October a cut of the same instrument appears, showing the base mounted on struts secured to the back board.

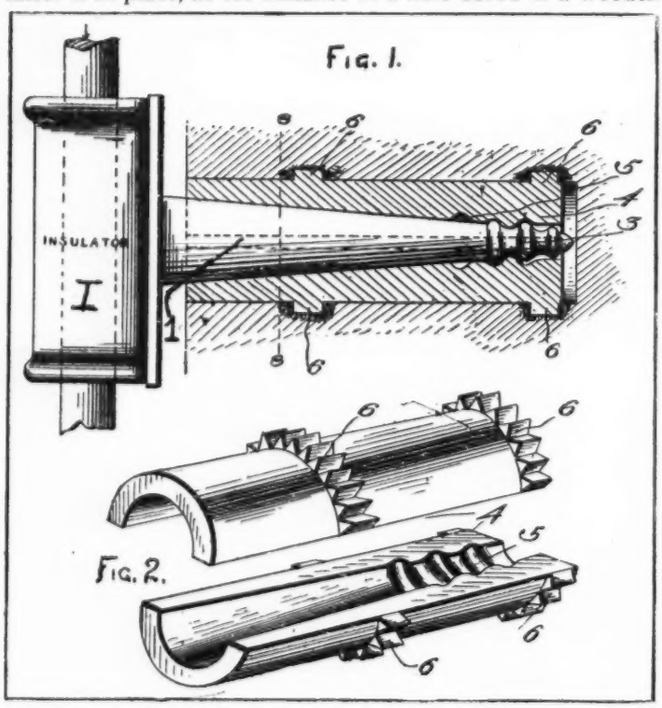


741,899—TELEPHONE SUBSTATION APPARATUS.

There are five claims in the patent, all directed to the particular features referred to.

741,994—N. F. Anderson and E. Bebler, device for attaching insulators to their supports.

This is really a device for securing the insulators of lightning rods, but it might well be used for ground wires or other purposes. It consists of the internally screw threaded split tube *4*, having pointed projections or teeth around it. The conical insulator pin *1* is inserted in the tube after the latter is in place, as for instance in a hole bored in a wooden



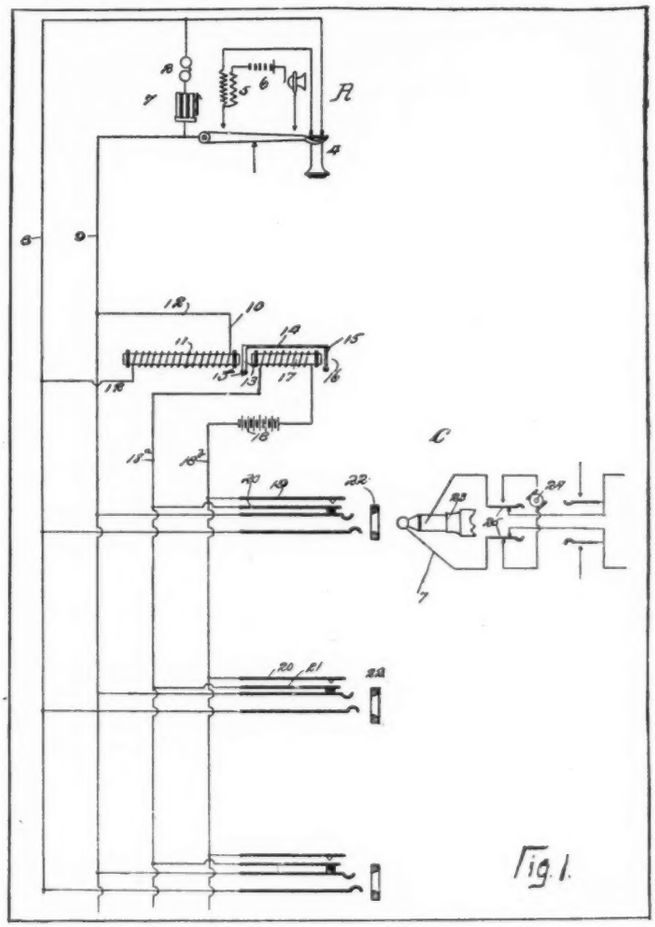
741,994—DEVICE FOR ATTACHING INSULATORS TO SUPPORTS.

post, and being screwed home by means of the threads *3* and *5*, spreads the parts so that the teeth *6* sink into the material, as shown in Fig. 1. *1* is the insulator body, through which passes the lightning rod or other conductor. Fig. 2 shows the split tube separately. It will be noted that this device can readily be removed as well as put up.

742,165—H. P. Clausen, line annunciator.

Nearly every telephone man knows Mr. Clausen and his careful, conscientious work for the American Electric Telephone Company. Mr. Clausen has made many inventions, the present one being of minor importance, relatively speaking, and it is safe to predicate of any one of them that it is not only completely thought out, but a practical thing, before it leaves his hands. While modesty has frequently kept him in the back-ground, this gentleman is entitled to as much credit for his contributions to Independent telephony as some of those who have made a great deal more noise and show.

The gist of the present invention lies in the provision of a retaining coil for the armature and also for the drop of a line annunciator, the main coil being high wound and bridged, and the retaining coil being connected in a local



742,165—LINE ANNUNCIATOR.

circuit extending to all the jacks of the line and including a battery. In the case of ordinary bridged line drops, it is, of course, a classic criticism that they cannot be used on multiple boards without disabling devices similar to the one here presented, for the reason that ringing current sent out from any jack throws down the drop and indicates a call at the answering operator's position. To prevent this, Mr. Clausen has designed the structure shown in Fig. 2 and the connections shown in Fig. 1. In Fig. 2, *32* is a frame screwed to the tubular shell *11* of the line magnet, whose terminals are shown at *31*. *13* is the armature carrying the arm *14*, whose terminal hook *15* engages the drop *16* and holds it up. *34* represents in section a continuous strip of brass or steel, to which a number of these annunicators are attached to form one "bank" or "strip." *40a* and *40* are brass plates, the latter carrying the number and being normally concealed by the drop.

This much of the construction is quite old and well known, having been put on the market by the American

Electric Telephone Company several years ago. In the frame *32* is supported a short magnet *17* having one end of its core toward the armature *13*, and the other end protruding through the strip *34* and the plates *40* and *40a*, as shown at *38*. The armature *13* is fitted with an adjustable screw *37*, which serves as a distance piece and prevents sticking. Obviously, when the magnet *17* is energized, one end of its coil attracts the armature *13* and the other end attracts the drop *16*.

In Fig. 1 the jacks are shown at *22*, the jack springs being connected as open multiples on the line *8-9* of subscriber *R*. Each jack has an extra pair of springs *19-20*, closed

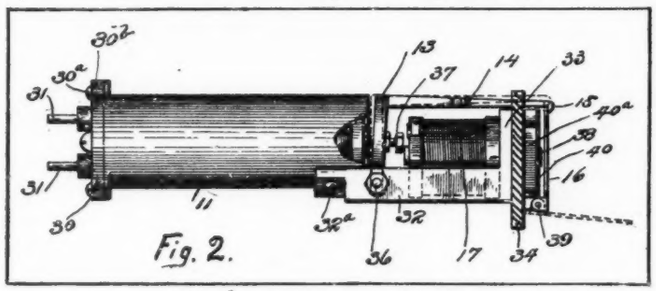


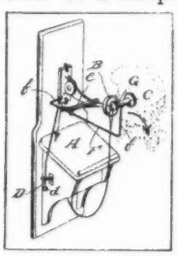
Fig. 2.

742,165—LINE ANNUNCIATOR.

when a plug is inserted, and all these springs are multipled across the circuit *18a-18b*, which contains the battery *18* and is connected to the magnet *17* of the annunciator. In operation, when a plug *23* is inserted to call the subscriber, the springs *19-20* of the jack used are closed together, and magnet *17* of the line annunciator is energized, holding the armature *13* and the drop *16* against displacement, so that when the generator *24* is connected to line by the ringing key *25*, the current will produce no effect on the drop, even though the magnet *11* be energized.

742,182—G. W. Ganoe, support for telephone receivers.

A good many receiver holders have been invented, but I do not recall seeing any good one ready for the market. The present invention comes nearer being a practicable scheme than most of those that have preceded it. It consists of a simple arm supporting the receiver and swiveled



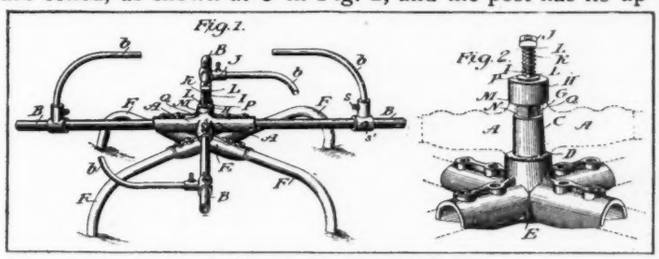
to turn on the end of a bar clamped to the transmitter arm. The illustration is a poor one, being taken in this case from the patent; but it will serve to show the principal features. The transmitter *B* is supported on the usual arm secured to a back-board, which also carries the desk *A*, beneath which the switch hook and ringer are housed. No generator is shown, Mr. Ganoe being up to date, and a common battery set being therefore illustrated. Upon the transmitter arm is clamped the bar *e*, whose outer end is forked and the forks formed with bearings for the supporting arm *F*, which consists merely of a stout metal rod having one end bent over horizontally at *b*, and the other bent up at *b'*. The end *b* is connected by a cord or wire with the switch hook *D*, a collar above the hook serving to depress it when the weight *d* is permitted to drop. The receiver *C* is attached to a cradle *G* at the upper end of the bent arm *b'*.

In operation, the weight of the receiver turns the arm *b'* down when not in use, in the direction of the arrow. This turns the arm *b* down, and permits the weight *d* to depress the hook *D*. When the telephone is in use, the receiver is held up by the ear of the user.

It is to be noted that the bar *e* and the pivoted clamps attached to it are shown as being formed up out of sheet metal, and the entire device bears the imprint of a shop man. It really looks like a commercial proposition, albeit simple.

742,296—John P. Delphey, wire pay-out-reel.

This is a type of pay-out-reel which has recently come into quite common use and will be readily recognized. The object of the invention is stated at length in the patent, but may be condensed to this: to provide a friction device or brake that will take up wear and regulate the speed of unreeling. In the figures, *A* and *E* are the spider hubs of the rotating and the fixed part respectively. The spider *E* has the supporting legs *F-F-F-F*, and a central vertical post or spindle on which the spider *A* turns. The post and bearing are coned, as shown at *C* in Fig. 2, and the post has its up-



742,296—WIRE PAY-OUT REEL.

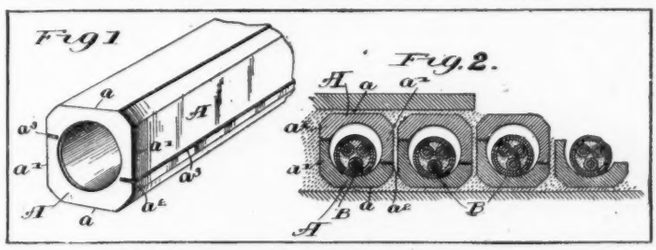
per end squared at *G*, with an upper shoulder *N* and a lower shoulder *D*. *H* is a friction nut sliding up and down on the squared end *G*, and held down by the coiled spring *K* and washer *P*, the spring being compressed by the adjustable nut *J* on the upper end of the post *C*, which extends outwardly as shown, in the shape of a reduced bolt. Of course this may be a separate bolt tapped into the end of the post *C*.

It will thus be seen that the spider A rests on a cone bearing, turning between the shoulder *D* and the lower face of the nut *H*, neither of these turning, and the friction being adjustable by the nut *J*.

In operation, the arms *b* are set vertical and a coil of wire laid on the spokes *B* outside the arms *b*, which are then turned around over the wire. The bands are then taken off the coil, and the friction devices being adjusted, the wire can be led off under any desired tension. Two or more reels may be set for the same tension, and as the wear is taken up this tension should remain steady through the life of the reel. This device also shows that it was designed by a practical man, and the drawings at least show a commercial article.

742,453—E. N. Lake, split electrical conduit.

This invention relates to split or "sectional" conduit, especially that made of clay or terra-cotta, and in single duct units. Fig. 1 shows such a unit, and Fig. 2 shows floor conduits in a central station or the like laid in cement.



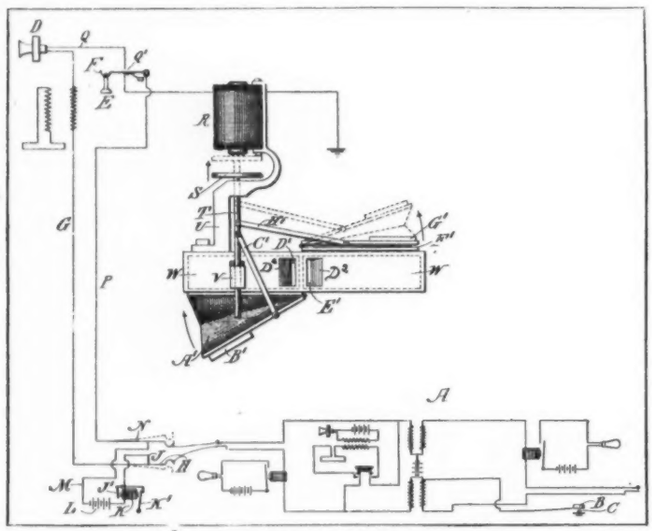
742,453—SPLIT ELECTRICAL CONDUIT.

In manufacturing this conduit the grooves *a3* are formed in the side walls extending almost through to the interior, leaving barely enough material to maintain the integrity of the tubes during transportation, but not enough to resist a blow, which separates the halves. According to the present invention the knives or scoring devices which mark the longitudinal grooves *a3* are set in offset relation or staggered with respect to each other, so that as the conduit passes through the moulding or forming machine staggered grooves will result, as clearly shown in the figures herewith.

Conduit of this kind is usually employed in high tension work, and to facilitate the installation of cable. It is of interest, however, in connection with telephone work and cable work generally.

742,619—R. H. Ferguson, signal or calling device.

There are some souls that approach the most prosaic or sordid questions in an attitude of elevation, and whose dealings with all the things of life breathe poetry. Such souls we call artistic, and they are as often found imprisoned in mechanics at the bench as in long-haired Philomels, who wander by the river's brink and sigh o'er nature's charms. The great difference is in their means of expression. The man by the river uses words, and he has at his command the endless creations in language of all the geniuses the world has produced; the man at the bench uses bits of metal, or hard rubber, or what not, and is usually slaving for a boss who cares a great deal more about getting 1,200 pieces per day than he does about the artistic feelings that can be expressed in a drop and jack when assembled. Nevertheless, in spite of the 1,200 per day required, and the hungry mouths dependent upon its being accomplished for their satisfaction, the good mechanic takes pleasure in his power to accomplish, as well as in the accomplishment itself, and in many cases if released from the narrow limitations of



742,619—SIGNAL OR CALLING DEVICE.

the bench he surprises himself as well as others by what he can produce.

I do not suppose Mr. Ferguson is a mechanic, but, if not, he shows a workmanlike acquaintance with mechanical design, and he has unquestionably a poetic spirit. His invention is a calling device for subscribers' stations. The artistic feature of his invention lies in the simulation of a human voice. The patent specification is very poorly prepared, and obviously by a person who is not familiar with the art; but the motive is apparent without description. There is a fundamental tone followed by the octave in a woman's voice, and usually by a third or fifth in a male voice. Mr. Ferguson evidently intends to reproduce these tones, for he substitutes at the subscriber's station for the usual polarized bell, a pair of reeds supplied by a corresponding pair of bellows, worked successively by an electromagnet. In the diagram herewith, which shows a substation in a common battery telephone system connected to the central station by the line *G-P*, *R* is the magnet controlling the call. The armature *S* of this magnet has a spindle *T* reciprocating in a frame *U* and a guide *V*. This guide is upon the side of an air chest *W*, to which are fitted the reeds *D2*, having openings *D'-E'* for the egress of air. Attached to the chest *W* are the two bellows *A'* and *F'*, one being always open when the other is closed. The tops of the bellows are provided with weights *B'* and *G'*, and are connected to the spindle *C* by links *C'* and *H'*.

The operator's cord circuit *A* has a bridged battery and repeating coil, and to one side of the battery is connected a ground tap with a key *B-C*. When the operator plugs in to make a call, the key *B-C* is depressed, when current will flow from the battery to ground at *C*, to the substation, to magnet *R*, to switch hook *S*, by line *P* back to central and through the jack *N* to the cord and to battery. The magnet *R* becoming energized will draw up its armature, closing the bellows *A'*, and opening the bellows *F'*. The finger being removed from the key *B*, this circuit will be broken, and the magnet *R* will release its armature, permitting the bellows *A'* to open and the bellows *F'* to close under the influence of their weights. Thus the air will be forced alternately over the reeds, and by properly tuning these reeds the desired musical intervals may be obtained. The operator can repeat the call as often as she desires, and the man in the basement, instead of hearing the clangor of a bell in the office upstairs, will hear a dulcet voice, which, indeed, would be not only suggestive, but quite appropriate, for the operators in most exchanges have good voices, rendered sweet in many cases by polite practice.

The possible extensions of this idea are fascinating to contemplate. True artistic feeling, having achieved the present success, should now dictate the abolition of all inappropriate sounds, and the substitution of suggestive tones therefor. While the loud jangle of bells may still be used for fire, no burglar alarm will henceforth be complete without an attachment to cry in raucous tones six different kinds of murder and police. Money boxes and plate chests might easily be made to contain portable devices of this character, and then we would approach very closely the golden harp of the fairy tale, which called to its master when being taken down the bean-stalk.

742,886—H. P. Maxim, charging system for secondary batteries.

The object of this invention is to provide a system by which a secondary battery may be properly charged from an unsuitable source such as an alternator or a high voltage generator. The patent is assigned to the Westinghouse Company of Pittsburg, and while the design is for a charging set for automobiles, the claims would cover an installation for any purpose, so that the patent might well be scanned by all those who are using motor-generator sets in their power rooms.

In the diagram herewith *2* is the secondary battery to be charged. *5-6* are the incoming mains, passing through the usual main switch and fuses *15-14-14* and so to the motor *3*, which in this case is shown as an alternating current induction motor. *1* is the generator, provided with a charging or field rheostat *27*. From the generator the charging circuit *16-17* passes through the switch and fuses *15a-14a* to the battery, being connected to the usual ammeter *18* and voltmeter *19*.

In the main circuit *5-6* is inserted an unload breaker *7*, consisting of a pair of arms *9* dipping into mercury cups *8*, the arms being ends of a coil *10* wound around a core *11* which carries opposite arms *12* held up against a connecting bar *13* as long as sufficient current is passing. The core *11* is pivoted on its axis, and if the current falls below a predetermined limit it turns, letting the arms *12* drop and the arms *9* raise to break the contacts apart.

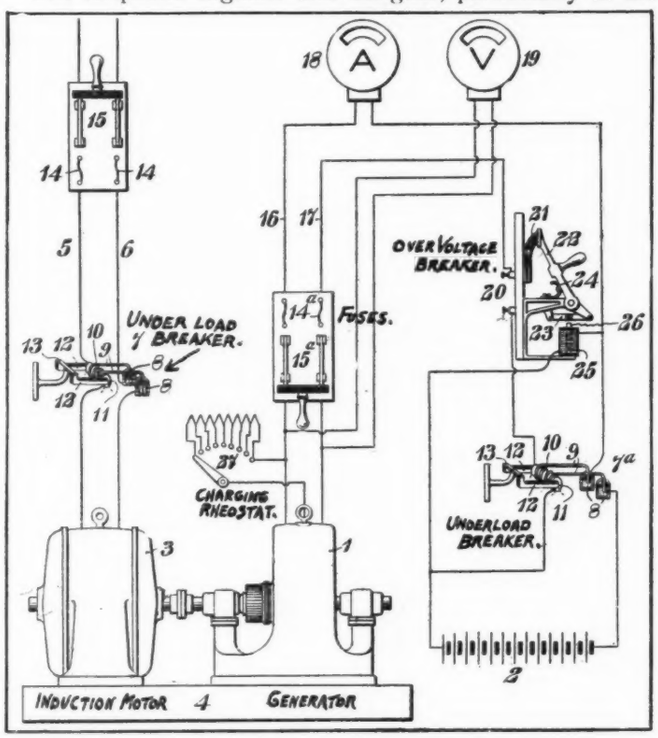
In the charging circuit an over-voltage breaker *20* is connected, having a switch arm *22* and contact *21* in series in the circuit, and its magnet *25* bridged. If the voltage rises too high the magnet pulls down the toggle joint *23*, and the spring *24* throws out the arm *22* to break the circuit.

In the charging circuit an underload breaker *7a* similar to the first one, *7*, is also connected.

Now, if the current fails in the motor circuit *5-6* the breaker *7* will open. Power being thus cut off, the breaker *7a* will open and prevent the battery from discharging back through the generator. When the battery is fully charged the over-voltage breaker *20* will open, throwing the load off the generator. Both underload breakers will thereupon open and the entire system will be shut down. If by reason of a short circuit or other cause too large a current flows anywhere, the fuses *14* or *14a* will blow, and both underload breakers will then open, shutting down the plant.

The first claim reads: "The combination with a motor generator and a secondary battery to be charged thereby, of overload and underload interrupting means in the supply circuit and overload, underload and over-voltage interrupting means in the circuit between the motor-generator and the battery."

The telephone engineer and designer, particularly in the



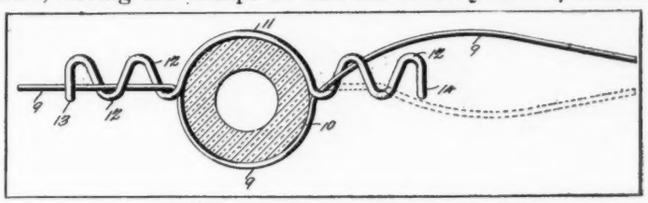
742,886—CHARGING SYSTEM FOR SECONDARY BATTERIES.

Independent field, does not always consider it necessary to post himself as to power and lighting practice. With the advent of the common battery, however, conditions have changed, and cases like the present emphasize the necessity for consideration, not only of points of practice, but of possible patent complications. The Westinghouse and General Electric Companies are not in the telephone business, but if their present policies are followed for a few years longer they will control a large part of the electrical field by great numbers of more or less specific patents, which are always the hardest to defeat. With the many auxiliaries that are now required in telephone construction, such as power plants, subways, protective systems, and the like, telephone practice inevitably extends into the field so to be controlled. It would appear therefore that instead of being simplified the telephone patent situation is becoming more complicated with every issue from the patent office, and a high degree of both engineering and legal skill is requisite for the successful conduct of business.

742,890—George F. Moore, Jr., telephone tie-wire.

In ordinary practice a tie-wire is bent around the insulator and twisted around the line wire by the lineman. According to this improvement the tie-wires are ready provided with kinks or crimps and terminal loops, and when applied to the insulator the line wire is bent in and out of these crimps and loops, instead of bending the tie-wire.

In the figure a tie-wire is shown on a straight line. *10* is the insulator (in section), *9* is the line wire, and *11* is the tie-wire, having the crimps *12* and the ends *13* and *14* turned



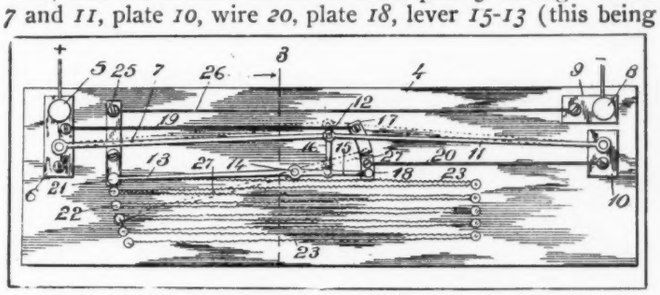
742,890—TELEPHONE TIE WIRE.

over to form loops. The dotted lines show how the line wire is twisted to work it into the crimps.

742,895—E. M. North, cut-out for electric currents.

This is a protective device adapted on the passage of a heavy current to cut in resistance and finally to break the circuit. The apparatus is mounted on a slate or other insulating base *4*, and comprises the terminal posts *5-8*, metal plates *6-9-10-25-17-18*, the toggle jointed levers *7-11*, a pivoted switch lever *13*, and the connecting wires *12-19* and *20*.

The toggle levers *7-11* are normally set as shown in full lines, and the normal circuit is from post *5* through levers *7* and *11*, plate *10*, wire *20*, plate *18*, lever *15-13* (this being



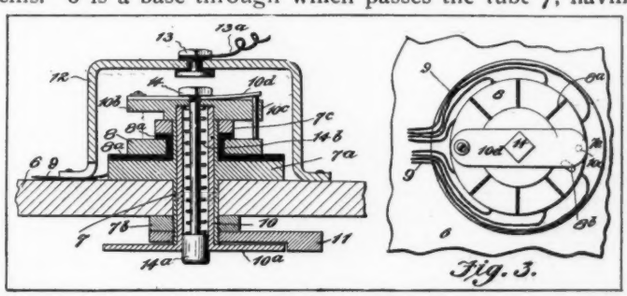
742,895—CUT-OUT FOR ELECTRIC CIRCUITS.

pivoted at *14*), plate *25*, wire *26*, plate *9* and post *8*. A set of resistance coils *23* is connected from plate *25* to and between contacts *22* in the path of travel of the end *21* of the lever *13*.

When a heavy current passes, the levers *7* and *11* heat up and expand, lengthening so as to push up the link *16*, raising the end *15* of lever *13*, throwing down the contact *21* and cutting in the resistance *23*. After the end *21* reaches the third contact *22*, the other end *15* of the pivoted lever passes off plate *18* onto plate *17*, thereby cutting out the levers, and short circuiting through wires *19* and *26*. This permits the levers to cool off.

743,281—Martin E. Hepburn, switch.

This is a selecting switch for intercommunicating systems. *6* is a base through which passes the tube *7*, having



743,281—SWITCH.

the internal collar *7a* and the external nut *7b*, carrying also on its outer end the indicator *11*. Mounted to turn within

the tube *7* is another tube *10*, having its outer end the disc *10a* which is turned to select, and which carries on its face the station numbers. On the rear end of this tube is a cross bar *10b* having a contact pin *10c* at one end and an overlying spring *10d*. Mounted on the face of flange *7a*, and held down by a nut *7c*, are the contact segments *8*, surrounded by insulation *8a*. There is one segment for each line as shown in Fig. 3. Inside the tube *10* a push button *14a* works, normally held out by a spring and when pushed in having a nut *14* on the inner end of its spindle come into contact with the battery terminal *13* on the enclosing case *12*.

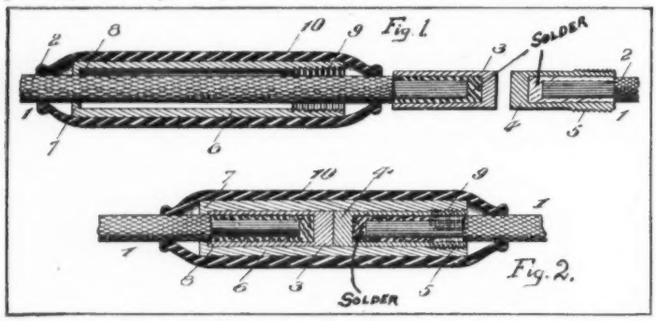
In using the switch to select a wanted station, the disc *10a* is turned until the proper number is opposite the indicator *11*, whereby the bar *10b* is turned to bring the pin *10c* onto the proper segment. The push button *14a* is then pushed in to put battery to line to call.

743,305—Merling and Welde—Trimethylcyclohexenoncarboxylic-Acid-Ester, and method of making same.

This acid process may not be of particular use except to general electro-chemists, but its name commends it to some of our telephone inventors who love complication for complication's sake. The derivation is sufficiently indicated thereby to render further explanation unnecessary.

743,346—Joseph G. Swain, electrical connectors.

This is a sleeve connector having a soft rubber cover *10* drawn over the metal sleeve *6*. A pair of tips *3-4* are hollowed out to receive the stripped ends of the line wires *1*, solder being poured in to secure the tips on the wires. In putting the tips on, one of the wire ends is drawn clear



743,346—ELECTRICAL CONNECTOR.

through the sleeve, as shown in Fig. 1, being drawn back when soldered. The other tip *4* is then inserted and screwed home by means of the threads *5* and *9*.

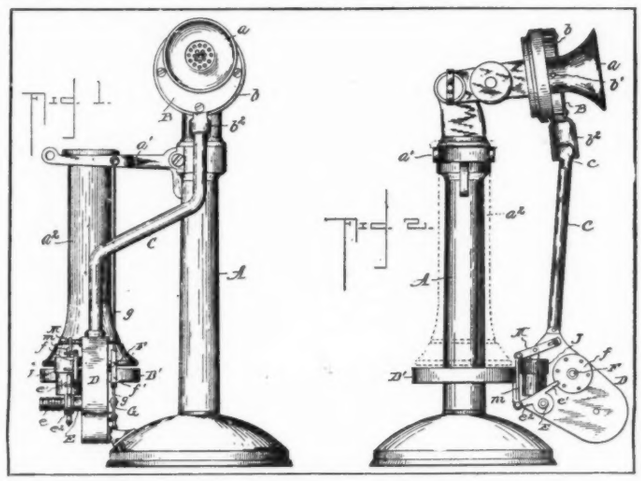
For a detachable joint this should make a very fair contact, but it is to be noted that its mechanical strength would depend entirely on the solder in its adherence to the wire, with a direct pull tending to separate them.

743,353—Nelson J. Tubbs, device for disinfecting telephones.

This invention is essentially "hot-air." I do not mean by this "good talk," because the invention won't talk. It is a disinfecting apparatus comprising a heater and a tube to carry the hot air around the mouth piece and another around the ear piece, of the transmitter and receiver, respectively. The inventor says that any parts of the instrument that might be injured by hot air may be protected by asbestos coverings. Speaking generally, if all telephone men were as considerate of their instruments I fear there would be a rise in the price of asbestos.

The invention consists essentially of a casing *D* containing a gas burner, from which a tube *C* extends up and has a sliding connection with a hollow casing *B* surrounding and opening into the mouth piece *a* of the transmitter, a lateral extension *D'* of the casing opening under the receiver when it is on the hook. The sliding connection permits the transmitter to be moved up and down as usual.

Inside the casing, as shown in Fig. 3, is the burner *E*, having its nipple for the gas pipe opening laterally, as shown in Fig. 1. A roll of percussion caps is held in the casing at *I* and is fed across an anvil *e3* by the toothed wheel *H*, turned by a ratchet on the outside (see Fig. 4) worked by a pawl *g* through a link *g'* connected up to the switch hook (see Fig. 1). The weel *H* has pins *h'* on its face which lift and drop a hammer *i* as the caps are fed along. The same movement that lights a cap turns on the gas. The spindle *F* carrying the wheel *H* also carries an outside wheel *f* (see

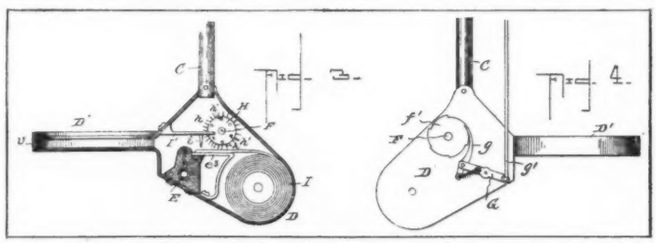


743,353—DEVICE FOR DISINFECTING TELEPHONES.

Figs. 1 and 2) whose pins work the gas cock *e* this being connected by an arm *e2* to a plunger *M* in a cylinder *J* containing mercury.

In operation, when the receiver is hung up after use, the ratchet is turned, which turns on and lights the gas. If no explosion follows to exterminate the user as well as the microbes, hot air will commence to circulate. When things are warmed up sufficiently the mercury in the pot *J* will expand and push up the plunger *M* to shut off the gas.

There is considerable mechanical ingenuity displayed in this apparatus, but the inventor has failed to explain how he gets more caps in when the supply is exhausted, and what happens to the caps in general when things heat up. We would suggest as an addition to make the apparatus complete, a portable fire-extinguisher and one of the disconnecting pulls produced by recent inventors. With these, one or



743,358—DEVICE FOR DISINFECTING TELEPHONES.

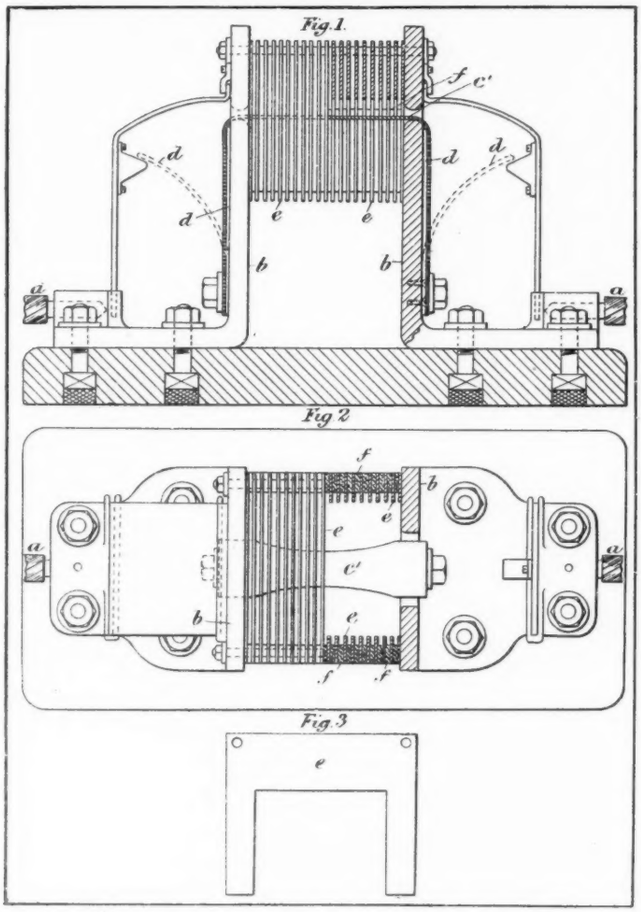
two good protective devices, and a few asbestos linings, the telephone would be robbed of enough of its terrors to be safely kept in any fire-proof museum.

743,384—Herald Hastings—Apparatus for breaking electric arcs.

The function of this apparatus appears from the title. It is shown applied to quick break switches and to fuses. The figures herewith show the fuse construction. The gist of the invention lies in surrounding the path of a possible arc by a resistance divided into sections and having a series of projecting points or blades. *b-b* are the fuse terminals of conductors *a-a*. *c* is the fuse, held taut by the springs *d*. Supported between the terminals *b* are a series of *U* shaped

plates *e*, opening downward, having an intermediate filling *f* along the sides, of a semi-conductor such as carbon paste.

In operation, as soon as an arc is formed across the terminals *b-b*, it is split up into a series of short arcs, each one of which has its own back electromotive force, the original electromotive force being supposedly canceled by the sum of the electromotive forces of the short arcs in series. The

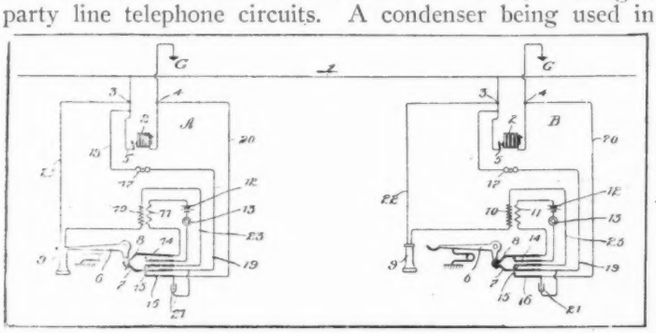


743,384—APPARATUS FOR BREAKING ELECTRIC ARCS.

inventor says that in practice it is found that the blades sufficiently repel the arc formed so that even if the blades *e* are on one side only, and a very small current is passing through the resistance *f*, the arc will be blown away and break by reason of its length.

743,421—G. Babcock,—telephone system.

The invention in this case relates to a detail, in bridged party line telephone circuits. A condenser being used in



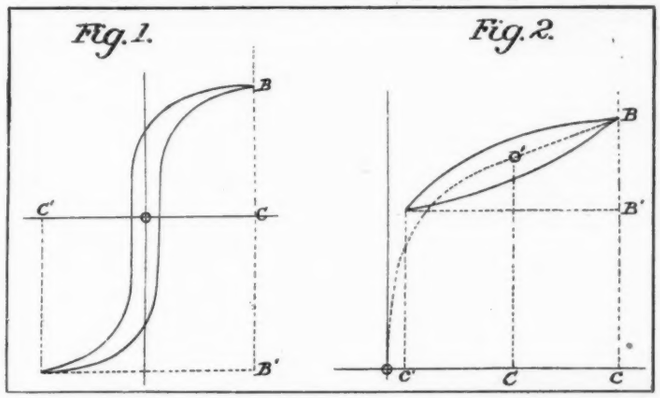
743,421—TELEPHONE SYSTEMS.

series with the talking set, is shunted by a low resistance when the hook is down and the telephone out of use. This protects the condenser from discharges from line to ground by which it might be punctured.

The diagram shows a party line *1*, with two stations connected. At each station is a condenser *21*, included in the following circuit when the hook is up: *3-22-9-10-23-15-7-21-16-20* and *4* to ground. Although not stated, the condenser is evidently intended to be of low capacity, so as to present considerable impedence to low frequency ringing currents, but to pass the high frequency voice currents unimpeded, the idea then being that if a receiver is left off the hook the telephone bridge will not shunt the line for *ringing* purposes.

743,444—C. F. Burgess and B. Frankenfield.—Means for regulating self-inductance in electric circuits.

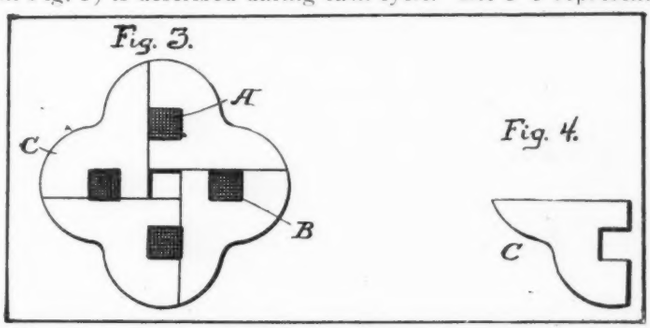
This is not, properly speaking, a telephone patent, nor is the invention immediately applicable to telephone purposes; but the main point involved is a suggestive one, and will doubtless prove of interest to the designing engineer. It re-



743,444—MEANS FOR REGULATING SELF-INDUCTION IN ELECTRIC CIRCUITS.

lates to the regulation of self-inductance in electric circuits carrying current, and including magnetic material in their magnet circuits. Its direct purpose is the regulation of current and pressure in alternating current circuits.

When a piece of magnetic material is magnetized by an alternating current, the well-known hysteresis loop (shown in Fig. 1) is described during each cycle. Let *O C* represent



743,444—MEANS FOR REGULATING SELF-INDUCTANCE IN ELECTRIC CIRCUITS.

the maximum instantaneous value of this current, and *B B'* the total change in magnetization caused by variation of the current from the maximum positive value *O C* to an equal and maximum negative value, *O C'*.

Now suppose that the same magnetic material is initially magnetized by a direct current to a point *O'*, Fig. 2, on the magnetization curve, which is represented by the dotted curve *OO' B*. The point *O'* then represents an amount of magnetiaztion *C O'* produced by a current *O C*. If an alternating current of the same value as before be used to magnetize the material in the same linear direction as the direct current, *C c* and *C c'* will represent its equal maximum instantaneous values, and the total change in magnetism caused by the variation from the maximum positive value

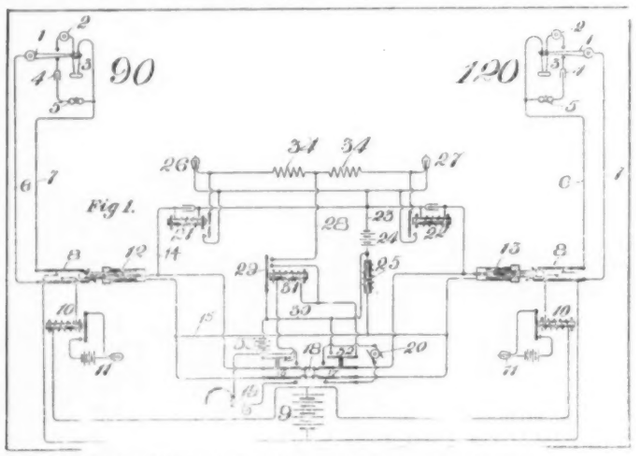
C c to an equal maximum negative value *C c'* of the alternating current will be represented by the distance *B B'*. The same number of magnetizing turns are assumed for the alternating current in Figs. 1 and 2 and for the direct current in Fig. 2, and the magnetism is taken in the same direction and in the same plane in both figures. It will be noticed that the range of variation *B B'* is greater in Fig. 1 than in Fig. 2. In other words, the self-inductance for a complete cycle will be greater for the conditions represented by Fig. 1 than in Fig. 2. When the self-inductance is varied by this means, the two magnetizations being in the same plane and in the same direction, the alternating current induces in the direct-current circuit an alternating electric pressure after the manner of the action of the primary of a transformer on its secondary. In many practical applications it is desirable to avoid this transformer action, and to do so the two magnetizing-coils must be so placed that their mutual inductance is zero. It is furthermore necessary that the variation of magnetism represented by the distances *B B'* in Figs. 1 and 2 be regulable by change of the direct magnetization with this arrangement of the coils.

In Figs. 3 and 4 is illustrated a construction embodying the invention, in which *A* represents the alternating-current coil, and *B* the direct-current coil, arranged at right-angles to each other, and surrounding these coils is core *C*, of magnetic material. This core can be made up of a series of stampings (shown in detail in Fig. 4), so that practically there is but one form of stamping to make up the whole core.

In regulating the self-inductance in one circuit, the current in the other circuit is, of course, first regulated in any suitable manner.

743,457—G. L. Cragg,—telephone exchange system.

In common battery systems employing supervisory signals, it is customary to provide some means to open the local circuits of the supervisories when the cords are idle, to avoid wasting current and giving false signals. This is usually done in Bell installations by having a third conductor in the



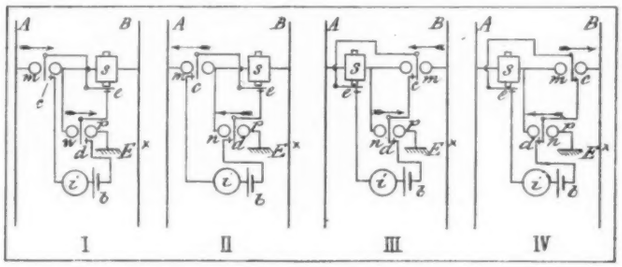
743,457—TELEPHONE EXCHANGE SYSTEM.

cord and using a three way plug and jack, the third pair of contacts being included in the supervisory circuit. In the present system, which is assigned to the Stromberg-Carlson Company, a relay *31* is provided, which puts battery on the supervisory circuit when energized, and is controlled by the operator's listening and ringing key. In the diagram, *90* and *120* are two suscribers' stations of standard common battery type, connected to the central office by line wires *6-7*, and there provided with the usual jacks *8*, and relays *10* and signals *11*, and all being connected to the common battery *9*. The plugs *12-13* and cord circuits may be of any desired type, having the bridged talking battery *24*, and one side of the cord containing in series the usual supervisory relays *21* and *22*, each shunted by a condenser.

The supervisory lamps *26* and *27* are included in a local circuit containing also limiting resistances *34*, and fed from the battery *24* through the wires *23* and *28-30*. This feed circuit is controlled by the relay *31*, itself controlled by the listening and ringing key *18*. When the ringing key is thrown to the right to spread the springs *17*, and cut in the generator *20*, it closes the contacts *32*, thereby closing the circuit of magnet *31* through wire *30*, battery *33* and a normally closed pair of springs on the listening side of the key. The relay pulls up its armature *29*, and closes a branch of its own circuit from battery *33* through the armature, through the magnet *31*, and through the normally closed contacts back to battery. At the same time the wire *28* is connected to *30* through the armature *29*, and remains connected until the end of the conversation. At such time, after the subscribers have signalled for clearing out, the operator throws the key *18* over to the left, opening the normally closed springs and breaking the magnet circuit, thereby disconnecting the battery *24* from the supervisories.

743,512—C. M. Jacobs and A. H. Nicholson, apparatus for transmitting electrical communications.

The invention in this case relates to signalling over many-party lines, and in its operation it is very similar to the well-known Barrett-Whittimore-Craft system of the American Telephone and Telegraph Company. It consists in provid-



743,512—APPARATUS FOR TRANSMITTING ELECTRICAL COMMUNICATIONS.

ing at a transmitting-station keys or other means of sending either a positive or a negative current by either of the line conductors or by both of them together or a positive current by one and a negative current by the other. At each receiving-station the two conductors are connected with each other and to the earth, and in the three connections are placed relays, certain of which are so polarized as to be operated by positive currents, certain of which by negative currents, and others are not polarized. Where there are a number of receiving stations with which communication is to be established, there is placed in each a different combination of relays, and at the transmitting station there is provided means for transmitting to each receiving station the particular combination of positive and negative currents suited to the particular combination of relays at that station. The relays are in each case applied in such manner as to bring into action a local battery and apparatus by which the signalling is effected.

The figure herewith shows four stations out of the twelve illustrated in the patent. Any suitable keys can be used at the calling station.

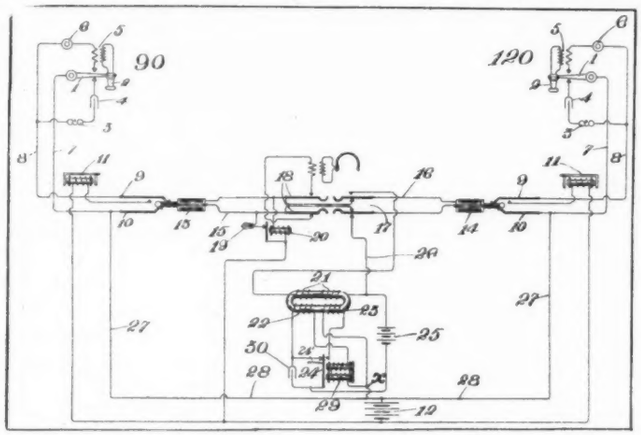
The single claim in the case is very specific, being limited to more than two relays at each station.

743,532—J. C. F. Malthauer, telephone exchange system.

This system embodies neither more nor less than the application of a vibrating pole changer to a typical Stromberg-Carlson circuit, the patent being assigned to that company. The pole changer is used in place of a generator for ringing, and is cut in by the ordinary ringing key.

In the diagram herewith *90* and *120* are two subscribers' stations connected to the central office by line wires *7-8*.

The plug *14* is the calling plug of the pair shown, and when the ringing key *17* is used, it connects this plug through circuit *26* with the secondary winding *21* of a transformer or induction coil. This coil has two primaries, *22* and *23*, the former connected in circuit with a buzzer *20* on one side and through wire *24'* to the back contact of the buzzer armature, this armature *24* being connected to battery *25* and thence to wire *26*. The coil *23* is connected on one side to the front contact of the buzzer armature, and on the other to the



743,532—TELEPHONE EXCHANGE SYSTEM.

point *x*, whence both coils are connected to wire *28*, and by wire *27*, jack spring *10*, plug *14*, and cord conductor back to the battery through wire *26*. When the key *17* is closed, therefore, the secondary *21* is put to line, and the buzzer circuit is closed, throwing current alternately through the two primaries, in opposite directions, to produce alternating current in the secondary. A condenser *30* shunts the contacts to prevent sparking.

All the claims are limited by the inclusion of the two primary coils.

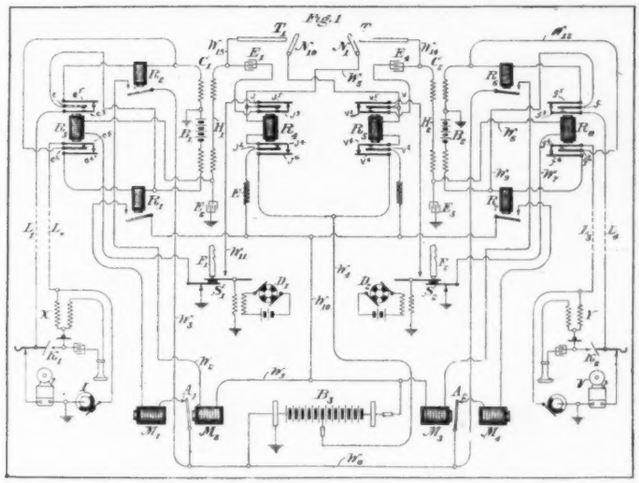
743,564. M. C. Rorty and A. M. Bullard, automatic telephone exchange.

This is a very ingenious and completely worked out automatic system, employing a single generator of current, for all purposes, located at the central office. That the invention has been fully reduced to practice is evidenced by the character of the mechanism illustrated. It is not only well designed, but bears the stamp of shop work on its face. Several of these patents have been issued recently, and their advent is somewhat notable by reason of their being assigned to the American Bell Telephone Company.

The general scheme is similar in its underlying principles to that involved in the standard relay type of common battery system employed by the Bell company. The common battery is normally bridged on all the lines through the contacts of their respective cut-off relays. Each line after passing the cut-off relay has two other relays connected in its opposite members, and thence passes to a permanently bridged repeating coil, between whose divided windings is connected the main battery. These two relays control the movements of a contact arm, which may thus be caused to connect itself with a multiple terminal of any other line desired. If that line is not busy this act of connection closes circuits which cause the selecting switch-arm to be joined to the secondary of the aforesaid repeating coil of its own line. If the line is busy, the calling-subscriber will hear the usual "tone test," but gets no connection. If the line wanted can be obtained, its bell is rung automatically.

A system of this kind comprises three principal parts, the transmitter, located at the subscriber's station, the automatic switch at the central office, and the circuits. The transmitter in this case is contained in a box having a dial upon its face and a hand moving over the same to a limit determined by a movable plug which may be set in any one of a hundred holes around the dial. The hand sets a clock train which in running down makes and breaks contact between two terminal springs a number of times proportionate to the distance through which the hand has been turned.

One of the automatic switching mechanisms is shown in



743,564—AUTOMATIC TELEPHONE EXCHANGE.

Fig. 4. The frame *J* carries between its two arms *23* and *24* the magnets *M1* and *M2*, together with the vertically movable rod *b*, carrying at its upper end the switch finger *N1*. The magnet *M1* is used to step this rod up until the finger

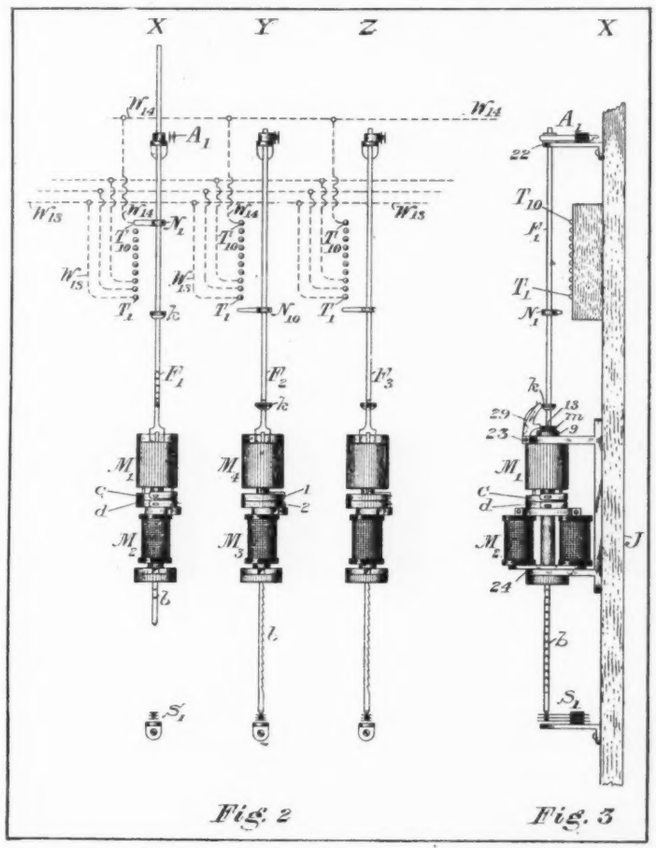


Fig. 2 Fig. 3

743,564—AUTOMATIC TELEPHONE EXCHANGE.

N1 comes opposite the desired one of the multiple contacts *T1*, this being accomplished by means of the armature *C*, which carries the spring pressed pawl *1*, taking into rachet teeth formed on the bar *b*. The armature is normally held down by the coil spring *12*, resting in a recess in the

core of the magnet *M1*, and surrounding a tube *7* which is connected to the armature *C* and passes up through the core of the magnet, terminating in a head *m* above the same, this head having a slot *13*. The tube and disc *C* are kept normally turned as shown in Figs. 4 and 5 by the spring *9*.

Below the disc *C* is a disc *d*, which carries a detent pawl *2*. Disc *d* has pins *3-4* passing loosely through orfices in disc *C*.

Below disc *d* is an armature *g* carried on the top of a tube *8* which passes down through the frame *24* and has a spring *h* to keep it likewise turned into the position shown. The rod *b* passes directly through all the tubes and discs, and fits loosely in them, except the armature *g*, which has a square hole, and as the rod is square it must turn when the

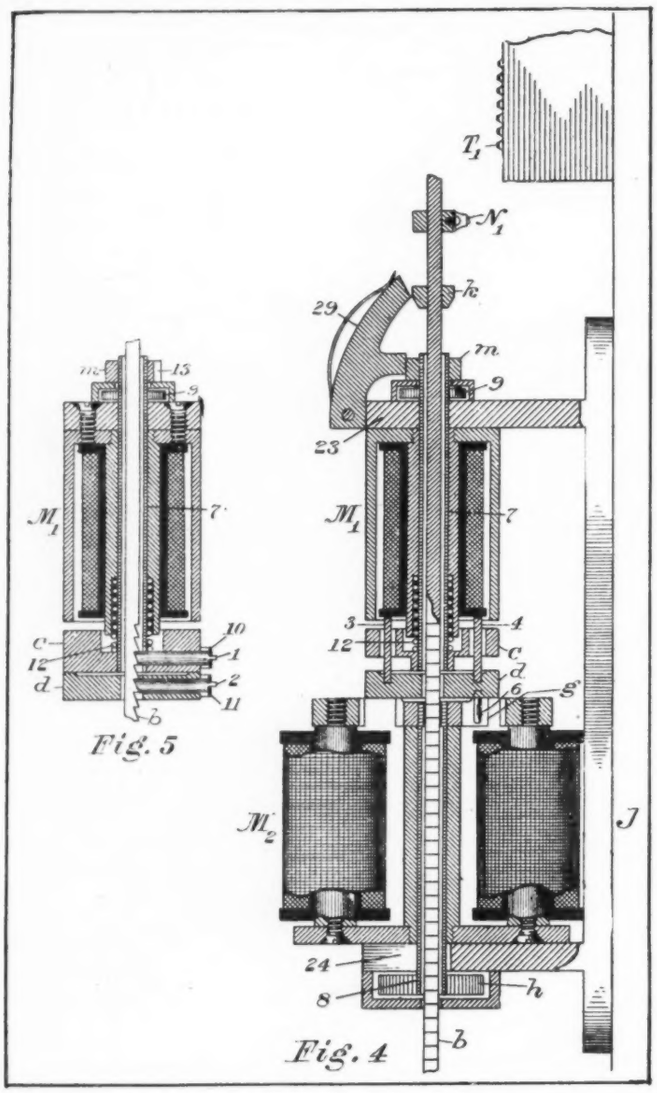


Fig. 4

Fig. 5

743,564—AUTOMATIC TELEPHONE EXCHANGE.

armature turns. After the magnet *M1* has stepped the switch-arm up, the magnet *M2* is employed to turn the armature *g* and thereby turn the rod *b* to bring the finger *N1* into actual contact with the line-terminal selected, and to hold it there. When the communication is finished the magnet *M2* is de-energized, spring *h* turns the tube *8* and the armature *g* back into position, turning the rod *b* also. The tube *7* and the discs *C* and *d* do not turn however, because after the bar *b* is stepped up and turned the catch *29*, pivoted on *23*, falls into the notch *13* of the head *m*, and so holds these parts. When the rod turns back, therefore, it turns its teeth at right angles to and out of engagement with the two pawls *1* and *2*, and gravity brings it down with a run. Just before it reaches its lowest position the collar *k* strikes the latch *29* and carries it away from the head *m*, whereupon the spring *9* turns the tube *7*, the discs *C-d*, and the pawls *1-2*, back into normal position shown in Fig. 5.

Referring now to Fig. 1, *X* and *Y* are two subscribers' stations, each having a transmitter *I* and a direct current trembler bell *V*. A ground tap is taken off between the transmitter and the bell, and the main battery at central is grounded on the side toward the bell, so that normally the latter gets no current, and the transmitter circuit is ordinarily broken. Suppose *X* desires to call *Y*: He sets his transmitter to *Y's* number and waits for it to run down. This makes and breaks the circuit from the battery at *B1* through relay *R1* over line-wire *L2*, and the relay opens and closes the circuit of the magnet *M1*, and steps up the rod *b* until the finger *N1* is opposite the contact *T10* of station *Y*. *X* then takes down his receiver, and as this closes the metallic circuit the relay *R2* takes current, and closes the circuit of magnet *M2*, which turns the finger *N1* until it touches *T10*. If *Y's* line is not busy this touch will close the following circuit: Ground, *B3*, from the middle point thereof by *W4* to *j6-j4-R4-N1-T10-W14*-repeating coil *H2-W6-R8-W7*-switch *S2* and ground. This energizes magnets *R4* and *R8*, the former pulling in its armatures *j* and *j2* to cut off the tone test and connect the finger *N1* to the secondary *H1*, for conversation; the latter *R8* pulls in its armatures *f* and *f2* and thereby reverses the battery *B2* on *Y's* line, the effect of this being to put battery between ground and the bell *V* and to ring the latter. *Y* then takes down his receiver, and thereupon conversation proceeds. When they both hang up, the parts are all automatically restored, as previously stated.

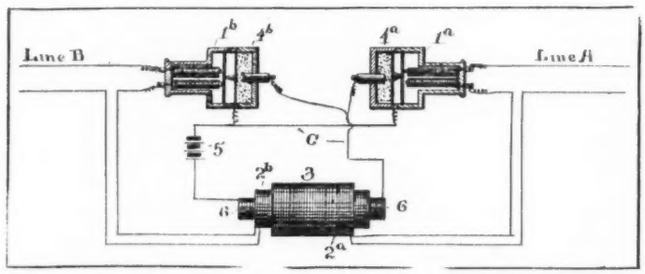
Connection will fail if *Y's* line is busy, if he is either calling or being called. In the former case, his switch bar *b* will have lifted its heel *F2* off the switch *S2*, which is on every frame, and there will be no circuit for magnets *R4* and *R8*. If he has been called, his own switch will be undisturbed, but the finger *N1* and *Y's* multiple-contact *T10* will be of the same potential, this following because *N1* is to the middle point of the battery and *T10* is in such case to the undergrounded terminal through the switch-arm of whoever called, by the following path: *N1-W5-R4-j4-j2-E-W10* and battery.

As soon as any switch bar rises from the switch *S1*, the tone test *D1* is thereby connected through the condenser *E1* to the secondary *H1* and ground. If connection is not obtained therefore, the calling subscriber hears this.

Contacts shown at *A1-A2*, in the diagram, are really cam-switches controlled by magnets *M2* to prevent waste of current through the magnets *M1* during conversation.

743,589, G. E. Sundquist, telephone relay.

This arrangement comprises an induction coil *3*, having two secondaries *2a* and *2b*, and one primary *6*. One sec-



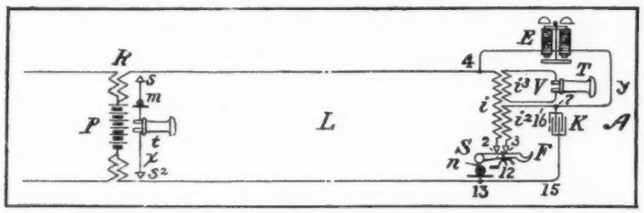
743,589—TELEPHONE RELAY OR STEP-UP.

ondary is connected to one line *A*, and the other to the other line *B*. Each line also includes a receiver arranged to act upon a granular microphone, and the two microphones are in parallel with each other in a common circuit *C*, which includes the primary *6*. Apparently it would be impossible

to use this instrument without getting the prolonged note ordinarily called "singing" or "howling."

743,594, G. K. Thompson, telephonic circuits and apparatus.

The specification and claims in this case have been very carefully prepared, having, in fact, that artistic finish which results from the hand of Thomas D. Lockwood alone, the well-known expert of the Bell Telephone Company. Mr. Lockwood also had a hand, together with Mr. Swan, in the preparation of the Rorty and Bullard automatic case I have just noticed. The present invention is not quite so striking as its description. It consists in putting the receiver



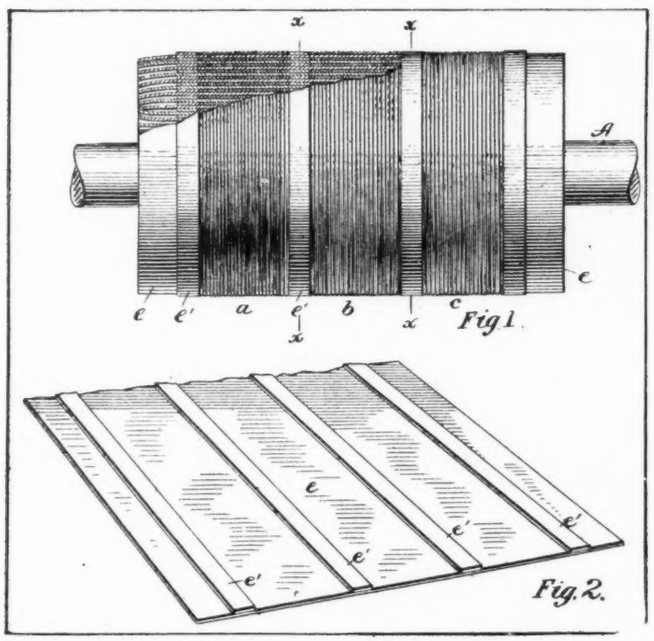
743,594—TELEPHONE CIRCUITS AND APPARATUS.

in a local circuit, to avoid side tone. Stromberg and others have done this, and there is always some loss in efficiency.

In the diagram, *L* is the line-circuit, *P* the common battery at central, and *A* the sub-station, containing transmitter *n*, receiver *T*, ringer *E*, condenser *K*, and induction coil *i*. As in the standard Scribner circuit, when the hook is up, current from battery flows over the line, through coil *i* and transmitter. The action of the transmitter sets up changes in the local circuit *15*, which are repeated into the line. Ordinarily, the receiver *T* is also included in the local circuit *15*; but here it is put in a separate local *V*, having a little winding *i*, on the coil *i*, all its own.

743,779, R. Varley, process of winding electrical coils.

This a rather ingenious process, in the line of one I noticed a short time ago. It is assigned to the Varley Duplex

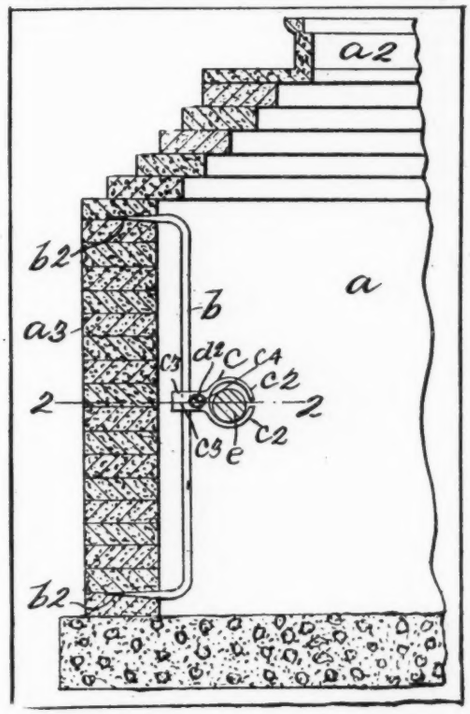


743,779—PROCESS OF WINDING ELECTRICAL COILS.

Magnet Company, and is intended for use with its multiple winding machines, although single windings may be made the same way. A layer of smooth paper having thickened edges is wound around a mandrel, and the wire is wound on the paper between the thickened parts, paper and wire being alternated until the coil is built up to the size desired. Figure 1 shows such a coil, on the mandrel *A*, and Fig. 2 shows a sheet of the prepared paper. The coil may be divided into separate coils by cutting down on the lines *x-x*. No separate heads are required for such coils, and they are more easily wound by machines.

743,805, H. C. Baker, Jr., cable holder for man-holes.

This invention comprises a vertical rod *b* having its ends turned over, sharpened and driven into the brick work of the man-hole *a*, as shown. A holder *c* is clamped on this

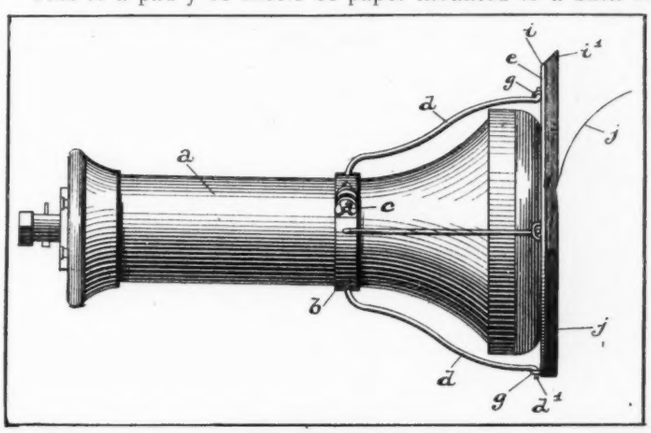


743,805—CABLE HOLDER FOR MANHOLES.

support. This holder consists of a pair of jaws pivoted together like the jaws of a pair of pipe tongs, their shanks gripping the support *b* and tightened thereon by the bolt *d2*. The holder is, of course, adjustable up and down.

743,896, Abraham Levi, sanitary attachment for sound receivers or transmitters.

This is a pad *j* of sheets of paper mounted to a back or



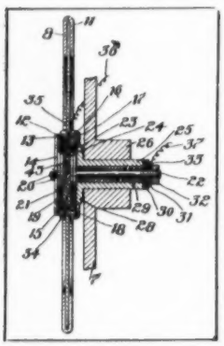
743,896—SANITARY ATTACHMENT FOR RECEIVERS OR TRANSMITTERS.

plate *i*, which is fastened onto a receiver or transmitter by the collar *b* and links *d* secured to eyes *g* on the plate. A sheet is torn off to expose a clean surface. Mr. Levi hails from Baltimore, where sanitary attachments are much need-

ed, especially in the sweat-shop clothing district. If he could convert some of the others to his apparently fastidious ideas there are many in and out of the ranks of the Yahudem who would be thankful, and crown him for the achievement.

743,951—A. Stromberg, telephone transmitter.

This invention is assigned to the Stromberg-Carlson Telephone Company and is the personal production of Mr. Stromberg, the founder of the company. When the Independent telephone industry was in its infancy some years ago the most reliable thing in it of any kind was the Stromberg-Carlson transmitter. The reason was said to be that Mr. Carlson personally adjusted and tested every instrument that went out. It is a fact that these two gentlemen deserve a great deal of credit for the way in which they met trials and tribulations in the past, as well as for the way in which they kept up the high standard of their goods. Nor can any one grudge them one particle of the great success they and their company are enjoying to-day.

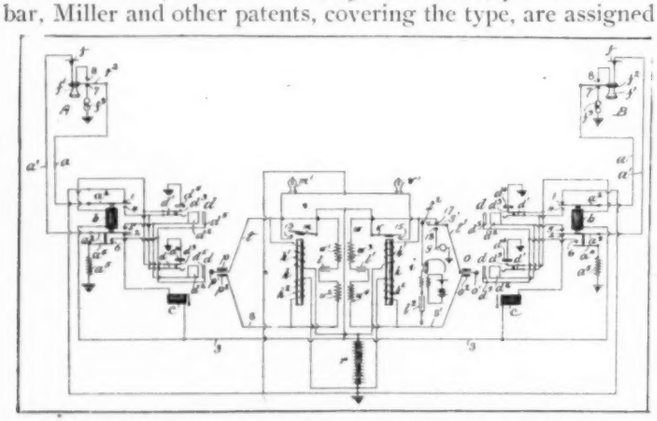


Mr. Stromberg states that the present construction, besides containing mechanical advantages, gives improved transmission. It will be observed that the principal feature is the location of the electrode chamber in the plane of the diaphragm. One or two other manufacturers have accomplished the same thing by forming up a chamber in the diaphragm metal. Mr. Stromberg makes his cup separate, however, as shown at *13*, the front electrode *19* being secured to the wall *14* of this cup. The back electrode *24* is carried on a stem *22*, insulated from the holding-stem *25*. The electrode itself lies against the inner face of a mica disc or auxiliary diaphragm *17*, which is clamped to the edge of the cup *13* by the threaded ring *16*. This ring rests upon a contact ring *35*, which rests against the diaphragm, and a cap-nut *34* screws down around the outside of the cup on the front of the diaphragm, which is thus tightly clamped and secured to the cup. The circuit-wire *36* passes to the ring *35*, and the wire *37* goes to the stem *32*, so no circuit is made through the bridge *26*, as heretofore.

This instrument is certainly cheaper to manufacture and more susceptible of adjustment than some of the others of its type, and it should be efficient in addition.

743,953. W. A. Taylor, central energy telephone system.

This is a telephone system of the type patented to Francis W. Dunbar, November 12, 1901, No. 686,272. The Dunbar, Miller and other patents, covering the type, are assigned

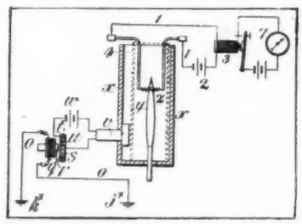


743,953—CENTRAL ENERGY TELEPHONE SYSTEM.

to the Kellogg Switchboard and Supply Company. The present invention relates exclusively to the manner of connecting the supervisory relays *h-k*, and is quite similar to the invention in Mr. Miller's patent which I noticed last month. The main battery *r* is bridged between the divided windings of each of the relays *h* and *k*. These windings are opposed, hence for current flowing in the metallic circuit during conversation no effect is produced on the magnets. When the subscriber hangs up, however, he grounds one side of his line in every case, and as the main battery is grounded on one side current flows through one winding only and energizes the magnet, lighting the supervisory lamp. A condenser is included in circuit with each side of the repeating coil to prevent a back flow of current.

743,999—J. T. Armstrong and A. Orling, system of electric communication.

This is a system of wireless telegraphy. The transmitting portion of the system is not of particular interest. It comprises two or more earth connections, through which are conducted "a combination of high potential discharges and low tension currents," whose circuit or circuits are completed through the earth. The receiving apparatus is also provided with two or more earth connections, which are adapted to cut the lines of current flow at points of different potential, causing some of the transmitted energy to flow through them and to actuate the receiver. Receiving apparatus is shown in the figure herewith; *jx* and *kx* are the earth connections, connected by circuit *o*, which includes a telephone repeater consisting of a receiver *q* and a microphone *r*. The local circuit of the latter includes the battery *w* and the receiver *v*. The latter acts upon an iron cylinder shown in dotted lines, and produces changes in the sensitive gas flame *y*. Above this flame is a platinum wire *z*, included in circuit with the relay *3* energized by a battery *2* to control the galvanometer circuit *7*. Very slight changes are thus supposed to be translated into perceptible ones.



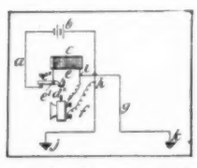
744,000. J. T. Armstrong and A. Orling, system of electrical communication.

This is a very similar case to the above, the illustration being exactly the same. The claims cover a microphone receiver having ground connections and adapted to control the supply of current from a local source to one or more telephonic receivers located within a chamber containing a sensitive flame above which is located a platinum wire controller.

It is understood, of course, that the resistance of platinum varies with its temperature, and inversely.

744,001—J. T. Armstrong and A. Orling, system of telephonic communication.

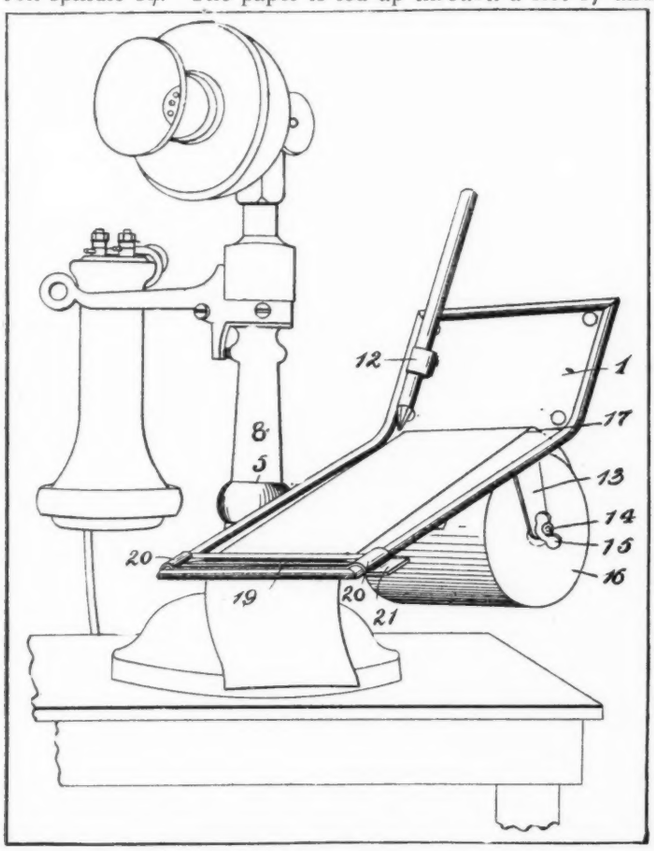
This is an attempt at wireless telephony. It comprises the old idea of grounding opposite ends of a transmitting circuit some distance apart, grounding the ends of the receiving circuit, and then trusting to leakage from one circuit to the other through the earth for transmission; but it includes also a mystical combination of "high potential discharges and low tension current." As a matter of fact, what is done is to connect the earth points on each side of the transmitter in a closed local battery circuit containing a spark coil. This is shown in the figure, the earth then constituting a shunt for the transmitter. As the latter varies its resistance, it is stated that "extra currents" from the coil *c*, as well as battery current, will pass through the earth.



The receiver is an ordinary telephone receiver connected between two separated earth points.

743,996. Urie and Markam, telephone tablet attachment.

The illustration in this case is so clear that description is almost superfluous. The tablet is formed of sheet metal with flanged and reinforced edges. Two tongues *13* are formed out of the metal and bent down to support the paper roll spindle *14*. The paper is led up through a slot *17* and



743,996—TELEPHONE TABLET ATTACHMENT.

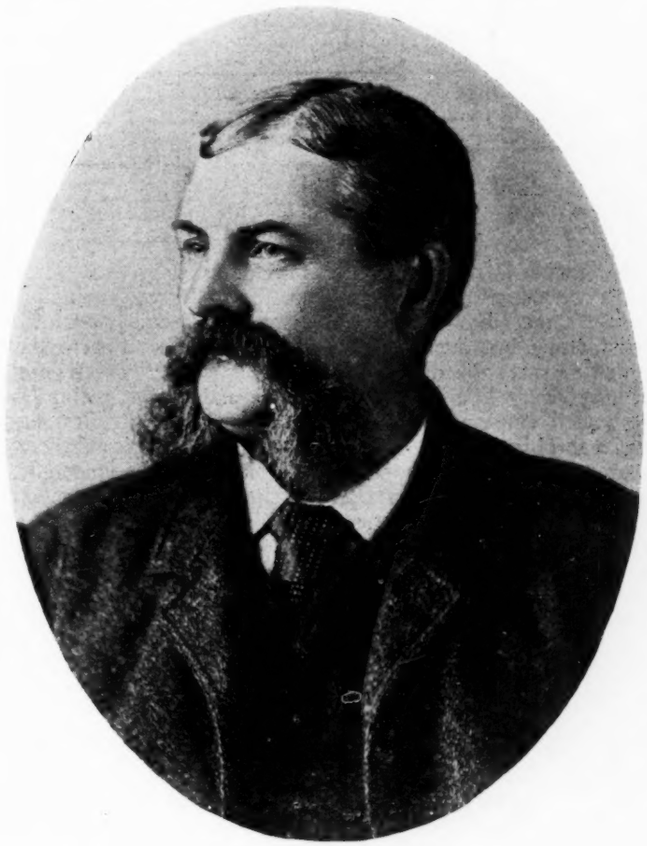
down the face of the tablet and out through another slot under the bridge *20*. It is torn off as used. Another tongue *12* is formed up to support a pen or pencil, and the entire tablet is adjustable to any angle on a cross spindle clamped to the desk standard *8* at *5*, or to the desk of a wall set.

LONG RANGE ORATORY.

The telephone is being freely used in England's present great political campaign. Recently Prime Minister Balfour delivered a notable speech in the Sheffield Drill Hall, every word of which was heard clearly in London by a large party of journalists. The trunk line from Glasgow to London was tapped at Sheffield and a connection made by the National Telephone Company into the drill hall, where specially powerful transmitters—six in number—were arranged about four feet in front of the speaker. At the London end the connections were obtained by wires provided by the National Telephone Company into the premises of the Electrophone Company. Each auditor sat with a double receiver pressed against his ears, and, so provided, he simply sat and listened. The success of the experiment was undoubted. It is no exaggeration to say that those in London heard better than did the great majority of Mr. Balfour's Sheffield hearers, whose hearing would inevitably be "blurred" by the sounds of their individual and immediate surroundings. The record was absolutely startling in its clearness and nearness, and journalists of experience were agreed that at a distance of 220 miles they could more easily have reported the speech of Mr. Balfour than had they listened from the Press Gallery, and he had spoken from the front Treasury Bench.

DEATH OF THOMAS HIPWELL.

Thomas Hipwell, aged sixty-three, died November 18, 1903, at his late residence 2417 Osgood street, Allegheny, Pa. The deceased was born at Norristown, Pa., in 1840, and his early life was spent in that vicinity. When the civil war was declared, he was among the first to answer his country's call and served nobly throughout. He was a member of the first New Jersey Cavalry, and was with Sheridan on his famous ride. At the close of the war he resumed his business career. For fourteen years he was connected with the Manhattan Brass Company of New York City. He severed his connection with this firm in 1886, and became identified with the Pittsburg Brass Company, of Allegheny, Pa. In 1894 he joined his son, H. H. Hipwell, the present head of the firm, and formed the Hip-



THOMAS HIPWELL.

well Manufacturing Company, with which concern he was identified until his death. He was an adept in his particular line, being an expert mechanical engineer and inventor. His keen judgment, his ever ready ideas, combined with perserverance, was a great factor in bringing the Hipwell Manufacturing Company to its present position in the manufacturing field. It stands to-day a living monument to his life's work and ambition. In his business he was a power, while his friendship was enjoyed by all who were fortunate enough to come in contact with him. His social and home life was ideal.

He leaves a widow and three sons, Mr. H. H. Hipwell, R. B. Hipwell, and Todd H. Hipwell, and two daughters, Mrs. F. P. Goodwin of Philadelphia, Pa., and Mrs. Beulah M. Lennig of New York. He was of the old school, honorable, manly and kind, and his death comes as a personal loss to all who knew him.

FLASHES FROM THE PILOT LAMP.

H. C. GOLDRICK.

A great number of the installations of four and five years ago were equipped for local battery transmission with common battery signaling, both for calling and disconnecting. The line signal was operated by closing the line circuit through the receiver, and the secondary winding of the induction coil. The disconnect signal was generally operated on one side of the line, through the ringers at the subscriber's station, to ground. Over this same side of the line, the subscriber's bell was also rung.

Such a circuit is shown in Fig. 1. Some employ a forty

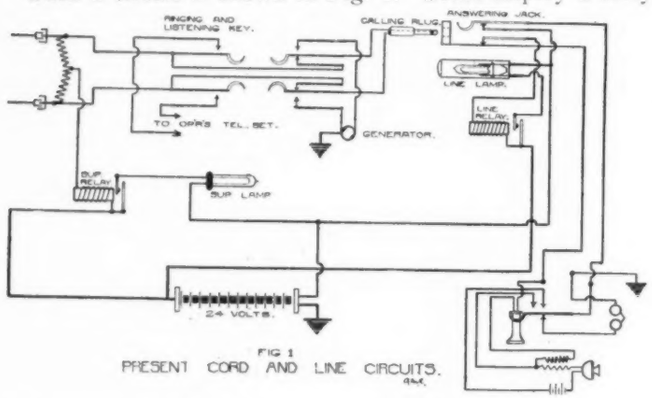


FIG. 1
PRESENT CORD AND LINE CIRCUITS.

volt battery, in place of the twenty-four volt as shown, and there are also other variations, but the underlying principles are the same. For individual service, this circuit is perfectly satisfactory, but many operating companies have been compelled to meet the demands of country subscribers by furnishing party line service. The original circuit cannot be very well employed for party line service. The first and greatest objection is due to the supervisory signal being operated by the grounds of the remaining stations on the party line, when conversation is being carried on from one of the stations. Another serious objection is the placing of

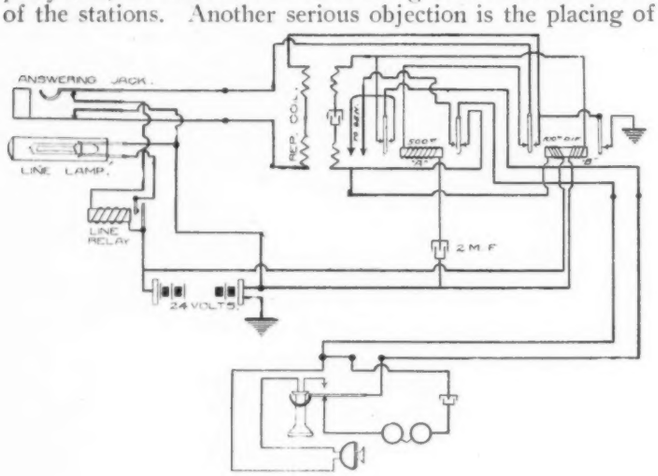


FIG. 2.
PARTY LINE EQUIPMENT.

local batteries at the various stations in the country, in many cases these batteries being difficult of access in bad weather, and always requiring considerable time to renew, even under the most favorable conditions. These conditions have been met by some companies using a flash ground contact at the subscriber's station and bridging the ringers through a condenser across the line. In addition to the bad features of special equipment at the subscriber's station, this results in very poor service, as proper supervision cannot be obtained, and the local battery trouble is ever present.

Other companies have installed a special desk for this class of service, using common battery and a combination cord circuit for connecting the lines of the two systems.

This not only slows the service in transferring from one to the other, but is expensive apparatus to install, especially when only a few such lines are in service.

Figure 2 shows a party line circuit which can be installed at small cost, and which operates the same as the regular line circuit. It has the advantage of employing common battery instruments, and the difference in the cost of the instruments on a two party line system will more than pay for the additional apparatus required at the exchange. With a slight change, this circuit can also be used for selective signaling.

The operation is as follows: An operator wishing to ring a party on this line inserts the calling plug in the jack, and pulls her ringing key, giving the designated number of rings. The alternating ringing current passes from the tip side of the plug through jack, through the 500 ohm ringing relay *A* through condenser to common, and thence to generator. When relay *A* is energized, the two middle line springs break their normal contacts, and close against the two contacts which introduce ringing current onto the line. In this manner, a clear path is established for the ringing current. Owing to the condenser being in series with relay *A* this relay will not respond to any current except an alternating ringing current. Relay *A* will operate in unison with the action of the operator's ringing key.

When the called subscriber removes his receiver from the hook, relay *B* is energized, thus opening the circuit of relay *A*, and cutting off the ground from the sleeve side of the exchange. When the subscriber hangs up, relay *B* becomes normal, thus operating the supervisory signal of the cord circuit.

In using this circuit, care should be taken to employ a reliable relay, otherwise trouble will be experienced. The writer knows of several such circuits being in use which have never caused one case of trouble since installation, the service being entirely satisfactory in all respects.

CHRONOLOGY OF THE TELEPHONE TEST CASE AT HAMILTON, ONTARIO.

March 1, 1902. The Bell charter for Hamilton being about to expire, the Bell applied for a five years' exclusive franchise—rates, $45-$30. Franchise tax per year $2,900. (Extra for long distance instruments, $5.)

March 18, 1902. The finance committee was about to report the by-laws for such franchise.

March 18, 1902. I appeared before the committee and in the presence of Mr. Baker, the Bell's provincial manager, filed a paper with the committee setting forth the account for 3,000 telephones (the Bell has about 1,400), one-half conduits; rates, $15-$10, long distance instruments free.

July 27, 1902. I filed with the city clerk an application for franchise: (a) Capitalization not to exceed, per telephone, $100; (b) treasury stock for long distance lines joining towns; (c) all conduits and not poles; (d) long distance instruments; (e) rates not more than $15-$10; (f) city service free; (g) city may take over, after three years, the company at face value; (h) forfeiture of charter if company sells, associates or leases same; (i) franchise for company formed to only do the business for Hamilton as above set out.

July 11, 1902. Government charter granted for the Modern Telephone Company of Hamilton.

August 17, 1902. Draft of by-laws submitted by Modern Telephone Company.

August —, 1902. Finance committee submits a by-law.

August 28, 1902. Aldermen Kerr, Domville, Burkholder and Nicholson appointed to go to the United States and examine as to system and competition.

September 26, 1902. Report filed. Committee gone one

week and visited Grand Rapids, Detroit, Toledo, Cleveland, Pittsburg, Rochester and Buffalo.

Reported against competition.

Reported against automatic.

Practically reported in favor of Bell monopoly.

November, 1902, I filed with the finance committee the proof for the conduit, cable and automatic items of the account shown in October issue of your paper. The mayor and the majority of the committee had evidently been stuffed in the usual manner of the Bell company, for the mayor insisted that his information about the cost of laying conduits was complete, and that it would cost $4 per foot instead of the 50 cents per foot charged in our account. (Of course, it is easy to see how he got his information. Some Bell creature must have told him that it would cost $4 per duct foot, *without telling him that they meant twenty ducts of one foot each.* This is a specimen of how the Bell company has deceived the mayor and the aldermen, and how gullible some mayors and some aldermen are.)

It was very plain to me that the Bell had influenced the situation, and as it is clear that no province has the right to pass an act permitting exclusive franchises for telegraph and telephone companies, it was perfectly safe to let this Bell crowd and such mayor and such aldermen have their little love feast and their little day. The people are sometimes slow, but they can be counted on to act.

My attorneys were instructed to watch this crowd and to proceed against any exclusive franchise that might be granted.

Previous to the passage of this late franchise to the Bell company my attorneys at Hamilton filed with the city clerk a letter setting forth substantially the following facts: That the courts had formerly decided that exclusive franchises for the Bell company could not be upheld.

That the Bell company then obtained from the *provincial legislature* an amendment to the municipal act which would permit a city to give an exclusive franchise for five years.

It was under this act that the Bell applied for and obtained the franchise in question.

The Bell's company charter from the government contains "For the advantage of Canada" provision. It is under this provision that the Bell all along claimed the right to enter a city and occupy the streets thereof without the consent of the city, because it operates in all the provinces, not merely and entirely in one. The contention of the Bell is that it is not subject to the laws of the provinces in the matter of the operation of its business.

Over two years ago the Bell was rioting around in Toronto, ignoring the city and planting poles wherever it pleased. My friend, the Hon. Oliver A. Howland, then mayor of Toronto, had the poles cut down, and proceedings were brought in the court to test this claim of the Bell.

Upon the trial thereof Judge Street filed an opinion in favor of the city. This opinion has just been reversed by the Court of Appeals, and now the case will go to the Privy Council in England for final decision.

If this decision is sustained by the Privy Council, there is, of course, an end to the claim of the right of the province to grant to cities the right to pass exclusive franchises for companies that operate between provinces.

The situation as to provincial and dominion acts, with reference to inter-provincial movements, is quite similar to our situation in the states, with reference to companies operating their business in and out and through the different states.

But we are not left to any doubts whatever.

By the British North America act a dominion parliament has exclusive jurisdiction to make laws for the regulation of trade and commerce. There was no power granted by such act to the provincial legislatures to create monopolies. It is contrary to the English system of government to give any person the exclusive right of exercising within the municipality any trade or calling.

This British North America act provides, section 91, that:

"The exclusive legislative authority of the parliament of Canada extends to all matters coming within the classes of subjects next hereinafter enumerated—that is to say:

2. The regulation of trade and commerce.

29. Such class of subjects as are expressly excepted in the enumeration of the classes of subjects by this act, assigned exclusively to the legislatures of the provinces."

Section 92 of this act provides as follows:

"In each province the legislature may exclusively make laws in relation to matters coming within the classes of subjects next hereinafter enumerated—that is to say:

10. *Local works and undertakings, other than such as are of the following classes:*

a. Lines of steam or other ships, railways, canals, *telegraphs* and other works and undertakings, connecting the province with any other or others of the provinces, or extending beyond the limits of the province;

c. Such works and undertakings as above, wholly situate within the province, are, before or after their execution, declared by the parliament of Canada to be for the general advantage of Canada, or for the advantage of two or more of the provinces."

As the Bell company's dominion charter has a provision announcing that it was chartered for the "general advantage of Canada," and as its lines of telephone connecting the province of Ontario with the other provinces, and the lines of the company in the province of Ontario extend beyond the limits of Ontario, it is quite clear that the Ontario legislature had no right to pass for the Bell company, the convenient, exclusive franchise act in question.

There is no possible doubt as to this matter.

The exclusive franchise granted by Hamilton to the Bell is absolutely void.

My campaign in Hamilton was, from the beginning, planned up to this very point.

We now have a chance to make a test case and expose the double claim of the Bell and its creatures.

For the purpose of getting into a town without its consent the Bell claims under the dominion act.

For the purpose of keeping competition out the Bell gets its friends in the Hamilton council to act under the provincial act.

And so a void franchise is enacted by members of the council who believe that the Bell, at $45 and $30, is the right sort of monopoly.

The matter will soon be where the people will act on the issue of competition. The case was started as a test one, and it will be carried through.

November 20, 1903. OSCAR WENTWORTH ROGERS.

TRYING A CAUSE BY TELEPHONE.

Distance does not interfere with justice in East St. Louis; at least, not so long as Justice Beach can reach a telephone.

The defendant, witnesses and lawyers in the case of William Lynch, charged with assaulting Lynn Bradford, were in Judge Beach's office, in East St. Louis, recently, while the Judge was in Belleville on business.

When called up over the long-distance telephone Judge Beach suggested the case be continued, but the defendant objected and proposed that the trial be held over the telephone.

It was agreeable to all parties and the witnesses were sworn by the clerk and each gave his testimony over the wire.

Judge Beach rendered his decision fining the defendant.

Another defendant took advantage of the telephone to secure a continuance in his case.

Abstracts of Telephone Convention Papers.

THE PRESENT TELEPHONE SITUATION.

The committee's assignment to me of this subject is my reason for its choosing. That I can consider it from the standpoint of all telephone men is very unlikely. That I may do so comprehensively from my own is my desire. That it shall include all I want to say and leave unsaid all I wish reserved for the future is my responsibility.

We are most of us three ply telephone men. We are builders, investors and operators. And the present appeals to these from different standpoints. The man who builds telephone lines and then sells them out sees matters different from those who operate lines. And each of these may see unlike the man who from now on may invest in telephone securities.

There has been a class of telephone construction men who have built job lots of telephone lines and exchanges and disposed of them to the unwary at fictitious prices. These exchanges and lines have passed on the strength of novelty and that peculiar attraction which the electrical has always offered to those who have its inspiration always acquired in advance of experiences. This will in time pass and properties will stand on their merits as to constructive features and values will adhere to telephone securities, which should be differentiated from properties, as they have brought returns not for one year or two, but for ten or more as undisturbed forces.

I am, however, confident that each of us has come to believe that construction must be of the highest standard in two elements—viz: quality and capacity. This means good material and enough of it. The knowledge gained by us during the past decade has enabled us to say that, given a certain population, prospective growth will be a certain amount and the actual demand is as definite. So when capacity is agreed to and quality is agreed we are one, and I doubt now if any are believing that economy can be considered along different lines. The question of apparatus at the present we are one to this extent, that the best is in the opinion of the buyer always bought and no one is able to convince the public that any one make is the best.

It is quite strange that telephone men are one as to where and when to use iron, copper, cedar, magneto or common battery equipment. While some are cautiously advocating automatic apparatus, yet ideas are quite harmonious on this radical departure; and were it possible for ten construction men to be given the job of building as many different exchange or toll lines to do the same work the results would be singularly alike.

To the operator of telephone lines the situation has become more complex. Not like the builder, we are unable to agree upon how to operate. Measured service is the ideal of the Bell company, common weal that of the other extreme, the mutual; and contracts for service are as various at the present time as are the steps between the two extremes. Some seem to think that this may always continue, but that it will not is evidenced by the fact that while railroads once had widely different methods they now are able to claim material uniformity of method. That we are slowly but surely drifting along towards that same condition is evident to me, and I think assured to all those who fully realize the present. Our gathering together here informally is only a forerunner of the time when we will meet under conditions which will enable us to become obligated to do and to operate under rules as binding as those of the passenger and freight associations of the railroads. I await the time when with authority we can agree to be bound to adhere to similar methods, and in order to agree we must delegate or be delegated with authority to do or not to do. It took railroads many years to learn what was best, and prior to that time they were even as we are now many men of many minds. You will remember that telephones and railroads interchange service on very similar conditions, and their experiences should be of great value to us at this time I heartily advocate a telephone association whose members are limited in number to authorized representatives of active forces, whose interests are in common.

Of the investor of money in telephone properties, or, rather, securities, I can not fully comprehend the position. His identity in the present telephone situation is not fully known. Unlike the railroad, the steamship, the express business, there has not been yet developed to full maturity the typical telephone investor. In point of fact we are to be his ancestors. He will be the man of our creation. As he comes forth he will walk under our careful guidance and as he develops his eyes will look up to ours for assurance, his steps will be firm as ours are firm and his character will ever be that of a child's training. As we are just he will be just. As we are successful he will be successful. As we become established in our task he will become established in his part. He will be faithful, I verily believe. He must be provided for by us and will eat at our table and partake of our sustenance. And so let us treat him even as he is sure to be, flesh of our flesh and blood of our blood, who is worthy of our good things and the portion of our strength.

And now, gentlemen, let me call your attention to this pilgrimage of ours. Pilgrims were pioneers. We are pioneers, and as such let us look at our present situation. Less than ten years of development and apparatus changing at an average rate of once every three years. Is this discouraging? No, pioneers saw rapid changes. Less than ten years and new companies increasing in size and numbers. Less than ten years among the aborigenes and they are half converted. Less than ten years without law and we judge without law. Less than ten years and vigilance we still form vigilance committees, and as a faithful member of which I now appear before you and foreswear allegiance to the Northwestern Iowa Telephone Association.—*By C. F. Bennett Before the Northeastern Iowa Telephone Convention at Cedar Rapids.*

TO INDEPENDENT TELEPHONE MEN.

It is indeed a pleasure for me, as a representative of this city, to welcome among our people a convention of Independent telephone men. The pleasure would be further emphasized if we were in shape here to welcome you as full brothers in the cause. But I will guarantee you that it is no fault of mine that Evansville is not thoroughly identified with the Independent movement. For more than a year my efforts have been expended to the end that Evansville might have an Independent telephone service.

When the city administration was first confronted by the telephone situation, I confess I was among those who honestly believed that to cut loose from the Bell or Cumberland company meant to cut loose from the balance of the world. But that delusion was quickly dissipated and it required but little investigation to bring about this change of heart. I found upon inquiry that the whole southern parts of Indiana and Illinois and the northern part of Kentucky were a perfect net-work of Independent lines and that the instruments used by the Independent people outnumbered those of the Bell or Cumberland by many thousands. I also found that everywhere Independent companies were in existence the price paid for service was much lower than where the Bell enjoys a monopoly, and I also ascertained that in every instance the Independent people were doing a good and a profitable business at the charges made.

Now I take it that a majority of the representatives to this convention are not telephone men in the strict interpretation of exactly what is necessary to constitute a telephone man. My impression is that the most of you are business men first, and telephone men incidentally, and that you have gone into the telephone business more as a protection to your ordinary business than for any other reason. Having been engaged in the business and having become familiar with its profits and possibilities, I can readily see how the business itself has been seductively interesting to you. The most of you gentlemen are patrons of the city of Evansville and her business interests, and this city being the local metropolis and the place you all desire most, you are in good position to do the Evansville cause a world of good. You should take up the fight in this city, and should call on the merchants who have their agents calling on you every week, and insist that they help the Independent movement in Evansville. Concentrated effort on your part in this direction would, I believe, guarantee an Independent local service, and would at the same time add much to the value and income of your various plants.

Now, gentlemen, I hope your deliberations here will be such as to make to the benefit of the Independent people. Your deportment while here will not be subject to scrutiny. The town is yours. You may make your own connection and ring off at pleasure.—*Address of Welcome by Mayor Covert of Evansville to the Southern Indiana Independent Telephone Association Convention November 11 and 12.*

THE SITUATION IN EVANSVILLE.

Although not a telephone man, it has so happened by force of circumstances that I have been somewhat identified with telephone business. To give the people of this city and neighboring territory a decent service at reasonable prices has been my sole purpose. Our friends, the Bell people, say they are poor and the business unprofitable, but we are not inclined to accept their statement, and feel satisfied that the motive of this discouraging statement is not free from a selfish interest. Anyway, Evansville has concluded to go into the telephone business for herself, not because it will advance the interests of the Cumberland people, but because it is to the advantage of the city and telephone users.

I regret that I can not speak of the status of the litigation between the city and this monopoly. It is with the court to decide, and any discussion of the case, under the circumstances, were improper; I may say, in all propriety, that we feel that we are entirely in the right and that we should and ought to win. Nothing can keep the Independent telephone out of Evansville. You may have noticed that this city is moving. The people are awake to the situation, and will not be longer misled by press clipping bureaus. Our friends, the opposition, call us "A lot of good people come to save a lot of good people from a lot of bad people." We are inclined to take the soft impeachment as true.

You will say that in the telephone field we are behind. We agree with you, but "watch us grow."

In eighty counties lying within a radius of one hundred miles of Evansville, in the three states of Indiana, Kentucky and Illinois, there are Independent telephones either in the way of exchanges or farm lines.

In the State of Indiana there are but two county seats in the entire State that have no telephone connection with Independent telephones, being Boonville in Warwick county, and Evansville in Vanderburgh county.

But two cities or towns in Indiana having a population of more than one thousand are without Independent telephones, being Boonville and Evansville, and Boonville will have an exchange before many months, a franchise having already been granted.

There are no counties in Illinois without at least one Independent exchange, and in most of them the Independent people have the county thoroughly covered. One or two Independent companies, after building, found that there were no toll line connection, and in sheer desperation for long distance service, made what is known as the sub-license contract with the Bell company.

In Kentucky there are eight or ten of these exchanges doing business on the sub-license plan, which will, so we have been informed, almost all of them, disconnect with the Bell company, as soon as the present contract expires, for in the meantime there has been built in every territory toll lines giving them outside connections superior to that now given them by the Bell company.

In the territory spoken of there are only three cities of any size, all of the rest being small towns, with a total of 17,504 Independent telephones, while the Bell company, in that same district, taking out the Evansville exchange, have 9,465 telephones. The Independent companies have almost double the number of telephones that the Bell company has in the same territory.

We have received a great many letters from managers of exchanges located in territory adjacent to this city, asking how soon they could expect to get connection, as there was a great deal of business that rightfully belonged to Evansville that was now being sent to Indianapolis, Louisville, St. Louis and Memphis, Tenn., owing to their inability to put their merchants and subscribers in touch with the wholesale houses of this city on Independent lines. The toll lines of the Independent companies now reach west into Missouri, Kansas, Nebraska, Iowa, Dakota, Minnesota and Wisconsin. South into Arkansas, Texas, Tennessee and Indian Territory. East as far as Vermont and Maryland, and north into Michigan.

There are at the present time in the State of Indiana 134,000 Independent telephones and about 40,000 Bell telephones, more than three to one in favor of the Independent companies. It is a safe statement that in this entire State thirty-eight per cent of the farm houses are now connected by Independent lines, and the same condition exists in Illinois and Ohio, while in some counties in York state seventy-three per cent of the farmers have telephone connection, a condition that was not possible under the monopoly of the Bell company.

Does any one imagine that Evansville should be or can be much longer the prey of the Bell monopoly? You don't know the temper of our people if you think so. Let the day soon come, as come it will, when Evansville will part company from Nashville and Cincinnati, and take step with other progressive cities of her class.—*By Hon. Albert M. Funkhouser, before the Southern Indiana Independent Telephone Association Convention at Evansville, Nov. 11 and 12.*

INDEPENDENT LONG DISTANCE LINES.

In his introductory Mr. Knoefel paid especial attention to the early mistakes that were made in the construction of long distance lines, showing that "cheap-john" methods prevailed largely. He also spoke of the early trouble in Independent companies, when they began business in Indiana eight years ago of getting long distance connection, "but to-day," said the speaker, "through the Independent long distance companies at Indianapolis and Louisville, the State of Indiana is connected. New Albany, Indianapolis, Fort Wayne, South Bend, Elkhart, Goshen, Lafayette, Vevay, Terre Haute, Vincennes, Rockport, Princeton and Huntingburg—in fact, nearly all towns and cities in Indiana, as well as St. Louis, Ohio and Kentucky—are all connected with Louisville and are looking forward to having Evansville added to the list.

"The Independent long distance telephone system in Indiana to-day connects with 60,000 telephones, while the Bell has only half that number."

Mr. Knoefel continued:

"The proper construction of toll lines should be extra heavy, using from forty-two to forty-five poles to the mile, and No. 10 copper wire. This kind of construction is a saving to the company in this respect: When a line is put up the expense of keeping it or maintaining it is very small, while in the old cheap way of construction where only thirty or thirty-five poles were used to the mile, there was continual crossing of wires, grounding of circuits and all sorts of trouble, all the direct result of cheap construction, which made the cost of maintenance on a cheaply constructed line very much greater than if they had been properly built at the start.

"Another mistake made in the early history of Independent telephony was the undertaking to put too many telephone instruments on one country line, or what we then called toll lines. You will remember as well as I in the early stages of Independent telephony we only had grounded lines and would put all the way from five to fifteen telephones on one of these grounded lines, which of course helped to weaken the current, and thus make the service less desirable.

"Another evil which developed in the early history of toll lines and especially of country lines, in addition to the party line business, was the unlimited time allowed any one to use a line. To illustrate, there were frequently five to fifteen instruments on a line and when one party would get possession of the line they would hold it perhaps thirty minutes or an hour talking foolishness, thus depriving others of the service when they really need it for business purposes.

"This is sufficient evidence itself that system and discipline must be introduced and properly carried into effect in the toll line business of Independent telephony.

"Another mistaken idea has grown up among the people, especially in the country, and that is to the effect that telephone lines can be built and maintained and service furnished, almost free of cost. Our farmer friends are especially impressed with the idea that when a company builds a first class long distance line and connects with the local concern, the owners and subscribers of the local company think they should have access to any point over the toll lines free of cost. It is a self-evident proposition to any thinking mind, that first class service cannot be rendered on toll lines, any more than on local exchanges, except there is first considerable money expended in the proper construction, and the men who invest their money must be placed in an attitude where they can realize a reasonable income on their investment, or capital will not enter the field of the Independents at all. And should the dictates of some of our farmer friends be heeded and followed it will result in the destruction of the Independent system in this country.

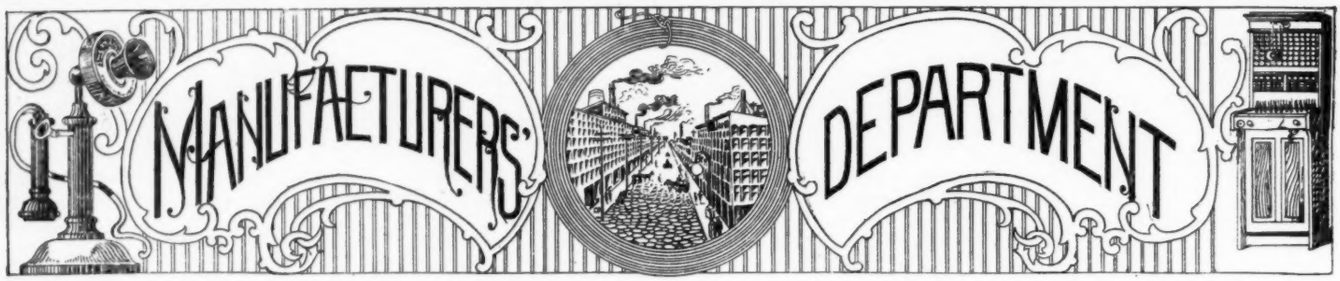
"I must insist and urge you to consider the importance of the statement I now make,—that good service can only come as a result of good construction, and good construction can only be had at the expense of considerable money, and to secure the necessary funds for construction it must be shown to those with capital that they will realize properly on their investment.

"But to be brief and yet to give those attending this convention some information, I desire to give you the following data: In the states of Missouri, Iowa, Wisconsin, Michigan, New York, Pennsylvania, Ohio, Indiana, Illinois and Kentucky, the Independent Long Distance lines have from three to five times as many connections as the Bell company, although these toll line systems have been built up almost entirely in the past four years, while the Bell company have been in the field for about thirty years, so that when the Bell company argues to the people of Evansville or any other section of this country, that the Independents cannot give them outside connection, they simply falsify the facts and place themselves in an attitude to be ridiculed because of their ignorance or malicious intent to mislead the public.

"Another fact worthy of note is that the toll system constructed within the last three years by the Independent people throughout the various states named above, gives far superior service to that of the Bell company, because their construction and apparatus are both superior to that of the Bell company, the Bell company having been built upon the old idea of construction which has proved itself to be untrustworthy, and hence inferior in service.

"No city in this country has a better opportunity to reap a great harvest of good results than the city of Evansville, and prompt and decisive practical business steps should be taken in the city of Evansville for the immediate construction and establishment of a first class local telephone system, because the long distance companies are ready to connect you at any time with the outside world and give you much better connections than the Bell company can give to your business men."—*By C. D. Knoefel before the Southern Indiana Independent Telephone Association Convention at Evansville, Nov. 11 and 12.*

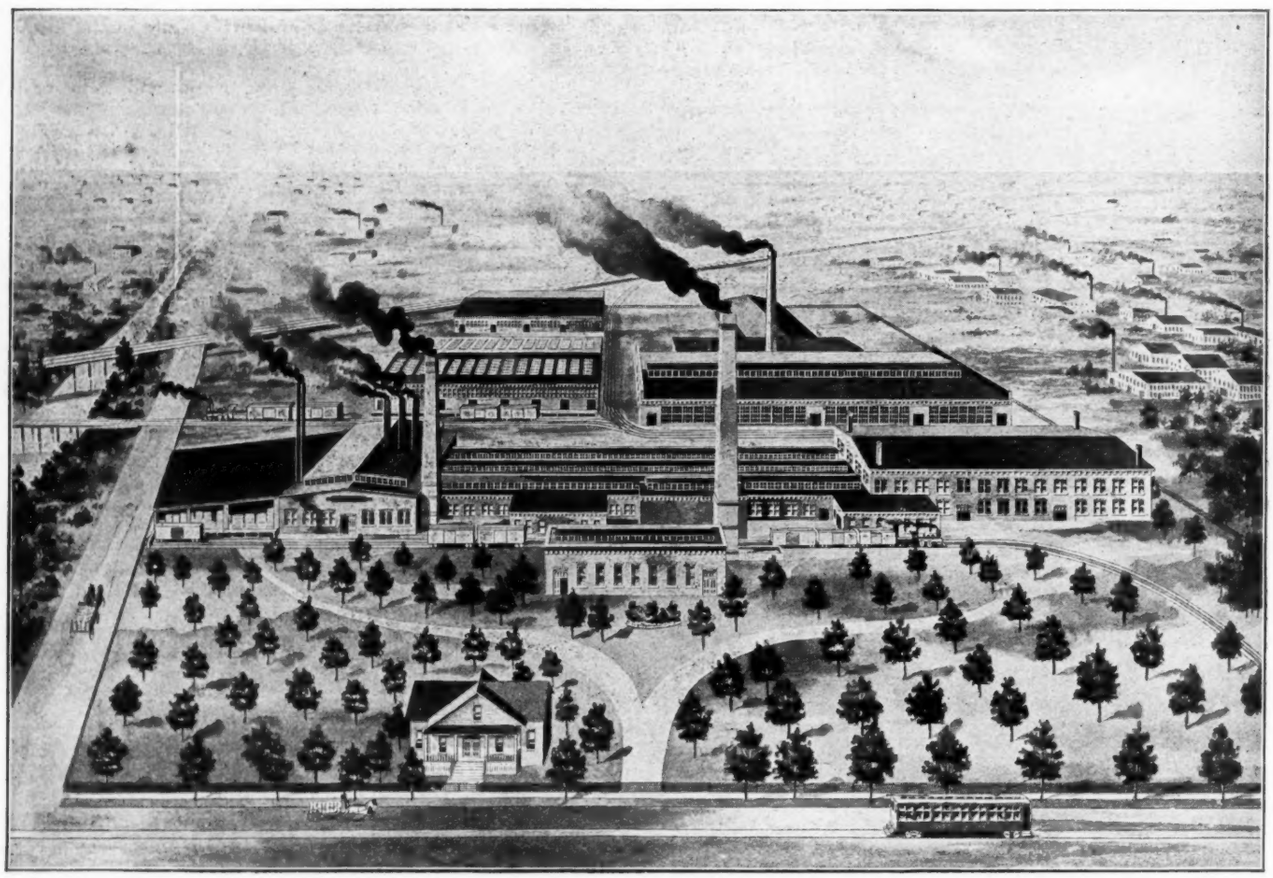
Governor Yates, of Illinois, recently granted long-distance clemency to a murderer, to avoid the possibility of a fatal delay in the mails. The sheriff was thus informed of a stay of execution over the telephone, but to make assurance doubly sure, a telegram was sent at the same time.



INDIANA STEEL AND WIRE COMPANY PLANT.

The accompanying illustration gives an idea of the magnitude of the plant of the Indiana Steel and Wire Company, Muncie, Indiana, which is an Independent industry devoted to the manufacture of telephone and telegraph wire.

The promoters of this plant are largely interested in a number of Independent telephone companies, and the mill is an outgrowth of an effort on their part to supply their own product and thereby facilitate a progress which was being hindered and retarded by an enforced reliance on combinations for material.



PLANT OF THE INDIANA STEEL & WIRE COMPANY, MUNCIE, INDIANA.

In capacity the plant is surpassed by but few in the United States, while in its modern equipment and the skill of the labor employed, none can claim superiority. Almost continuous operation has obtained since its inception two years ago, and the high grade quality of the output has elicited most favorable comment from those whose opinions have been made valuable by experience.

Geographically, Muncie is desirably located, being contiguous to the great Mississippi valley, while freight rates are but a slight advance over Chicago naming, thus enabling them to successfully compete for the volume of trade incident to this section and far west points. The business of this company is sufficiently great to secure through freight service to Chicago, St. Louis, and Mississippi junction points, on less than carload shipments, thereby insuring prompt delivery. The same facility of service obtains for eastern and southern trade. The five trunk lines leading out of Muncie, all quoting through freight rates, contribute still further to the advantage and brightens the future of an already successful industry.

The company invites correspondence from prospective buyers and will have representatives at the coming Inter State Convention to demonstrate the value of Indiana Steel & Wire Company's product.

AN ENLARGED AUDIENCE.

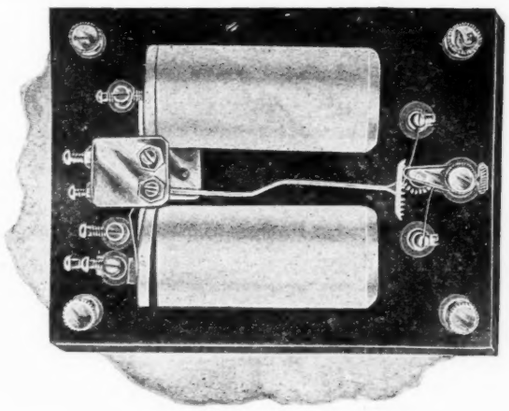
During the recent fall carnival held at Flora, Illinois, Governor Yates made a notable address on "The Development and Progress of Southern Illinois." Through the courtesy of Pettijohn, Pittman & Company, owners of the People's Telephone System of Flora, the Governor was

enabled to speak to every telephone subscriber in five counties. The Governor was highly pleased with the result. A special wire was run to the speakers' stand and a telephone placed in position. Every one heard very distinctly. The telephone used was a model 40, manufactured by the Chicago Telephone Supply Company of Elkhart, Indiana.

THE "HARTER RINGER."

The Current Electric Company, 52 State Street, Chicago, realizing the need of a power generator which can be used successfully and economically on the numerous small telephone exchanges, that is, exchanges having less than one thousand subscribers, which are rapidly coming into use in the smaller towns throughout the country, also numerous private exchanges in every large city, this company has endeavored to produce a ringer that would be practical under all circumstances, that would be simple in principle and construction, and that would not be too expensive, even for the smallest exchanges.

To produce such a ringer it was first necessary to consider the various conditions under which such an apparatus



THE HARTER RINGER.

must be used; second, how much battery, what kind of battery and how it should be used. To produce an alternating current from a direct current generator is an old, old idea. Numerous styles of pole changers have been made with a view of using them in connection with telephone exchanges, but only a few of them, however, have been found practical.

What the trade wants is a ringer that is simple, economical and cheap, that has all the necessary merits to comply with the various conditions usually found on the lines of telephone exchanges. The farm line, the long distance toll line, the local series line, rusty or corroded connections, shunts or short circuits on lines, present in themselves circumstances which are trying on the best of generators. It is also sometimes necessary to have a direct pulsating current for certain party lines systems.

Furthermore an operator spends only a small portion of his or her time in making calls. Even though there should be three or four calls per minute a generator would be idle the most of the time. Dollars spent for battery or other propelling means for a generator while waiting between calls is uselessly spent. The only time that one cares to have a generator in motion is during the period that you wish to use it. Then and then only is it of service to the user.

It is convenient and unnecessary to have switches for starting and stopping a ringer. Your ringer should always be ready for use nights or Sundays, as well as at regular hours without molesting the switch board or battery circuit in any way. It is not agreeable to have a constant humming noise from a generator between calls. It is also sometimes convenient to have a ringer that occupies small space or that can be hung on the wall in some convenient place.

With the above ideas in mind, this company has produced the "Harter Ringer," as represented in the above cut. Its principle and mechanism are extremely simple, its adjustment convenient, and it can be hung in the back of a switchboard to take the place of a buzzer or set in any other convenient place. Its dimensions are 4½"x6"x2¼". Its weight is much less than any other ringer on the market. Only one battery is used with the ringer, consisting usually of forty or fifty dry cells.

The principal functions of the ringer are two relays and a rocking commutator. One of the relays, the commutator and the battery are connected in series with the ringing circuit. The other relay is so located that the armature of the first relay will close a bridged circuit through the second relay whenever the external or line circuit is closed. When the bridged circuit has been closed through this relay, it continues to rock the vibrating commutator, which produces the alternating current, until the external circuit is opened. These three principal parts, together with the necessary binding posts and contacts constitute the complete ringer.

The relays are sensitive and act very quickly. The commutator has steel pivots, silver segments and steel brushes, with platinum contacts. The other contacts are also platinum.

The ringer does not operate except during the actual time that a call is being made, the battery remaining on an open circuit between all calls. It is always ready without any switches to bother with. Has a slight buzzing noise which will take the place of a buzzer if placed in or near the switchboard. It will produce a direct pulsating or an alternating current without any change or extra attachments. It does not wear on the machine or consume current between calls.

The price of this instrument is $12.00, f. o. b. Chicago. It is fully guaranteed, and the company invites correspondence from prospective buyers of this class of apparatus.

THE IDEAL CONSTRUCTION COMPANY.

The Ideal Construction Company of Lima, Ohio, has been doing a considerable amount of work since its formation. Recently the company purchased the Everitt-Moore interests in the Lima Telephone and Telegraph Company and has also been granted a franchise for the construction and installation of an Independent telephone system at Hopkinsville, Ky. The company is financing this proposition at the present time and expects to begin work on the system by January 1. The company will be a $100,000 incorporation and the system will be modern in every respect and will compare favorably with the new exchange recently built at St. Mary's, Ohio, by the Ideal Construction Company, which is conceded to be one of the best constructed systems in Ohio.

The Ideal Construction Company, composed of Arthur W. Hoge, C. E., and Gustav Hirsch, M. E., makes a specialty of telephone engineering and construction and invites correspondence from telephone men who desire figures on this class of work. The company is responsible and has the reputation of doing first-class work at a very reasonable charge.

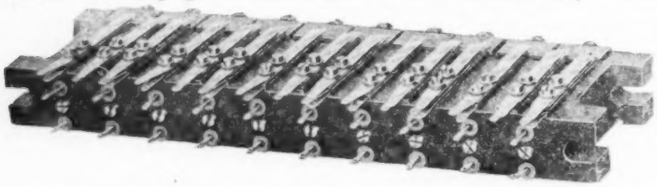
A NEW BOOK.

"Telephone Lines to Farmers" is the title of a new book recently issued by the Stromberg-Carlson Telephone Manufacturing Company of Rochester and Chicago. It is full of live, pertinent information on rural telephony and is an invaluable aid in building and maintaining farmer or rural lines. The headings of the different departments of the book

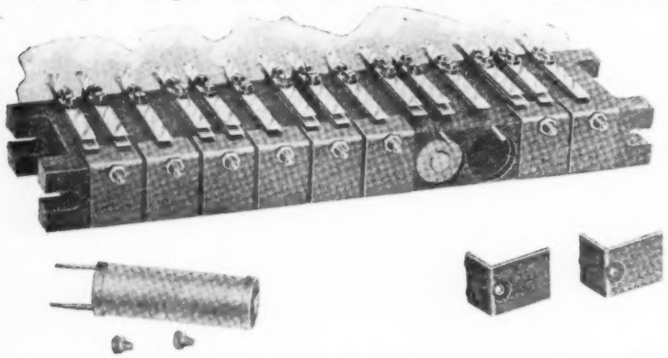
give a fair idea of the reading matter. Among the more pertinent captions are: "Brief Facts for Busy Farmers," "Some Telephone Talk on Village Exchanges and Farmers' Lines," "How to Organize a Farmers' Telephone Company," "Constitution and By-Laws," "Selecting a Telephone." These chapters are followed by illustrated descriptions of the company's product, some of the illustrations being in colors. The book will be sent free upon request.

A NEW RELAY.

Among the designs of new, up-to-date central office equipment for the year 1904 is one just perfected by the Western Telephone Manufacturing Company, and illustrated on this page. This is known as a "minor relay," and



was designed by Mr. Schwartz, formerly with the Western Electric Company and Kellogg Company. It consists of a single soft-iron casting, perfectly machined and drilled for ten holes in which the coils are set. These coils are readily removable at will. Overhanging the open end of each coil-core is suspended an absolutely perfect angle-iron armature, resting on a pin and self-contained in such manner that

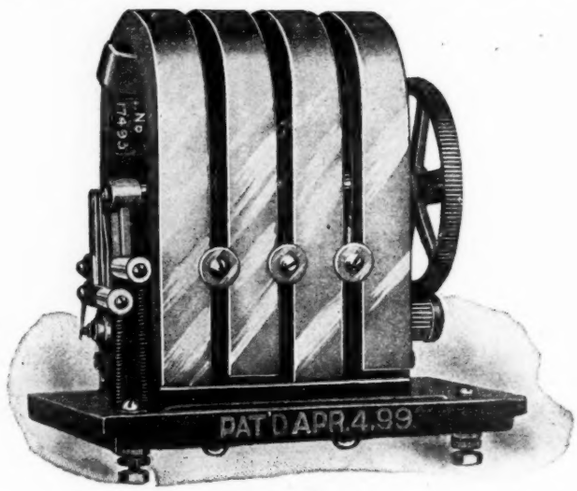


"jumping" or "shaking" out of position is impossible. This armature operates the jack-springs to open or close the pure platinum-pointed contacts for proper circuits. The prime object of this relay design was to produce a combination of mechanical, electrical and magnetic result, reliable and perfect at all times. In neatness, compactness and efficiency it bears undisputed evidence of the highest class.

THE MONARCH TELEPHONE MANUFACTURING COMPANY.

The Monarch Telephone Manufacturing Company of Chicago may be cited as an example of what earnest endeavor and honest business methods will accomplish. This company which three years ago occupied but a small room in a factory building, owning comparatively no machinery and employing less than a dozen hands, is now one of the leading telephone manufacturing companies of the country. This growth has not been of the "mushroom" variety, but has been steady, consistent and without a break. The foremost idea at all times seems to have been to make every piece of apparatus good from the smallest detail to the largest and most complicated part.

Mr. Earnest E. Yaxley, the treasurer and general manager of the company, is well known throughout the telephone field, as much of the apparatus now being used was invented and brought to its present state of perfection by him. Mr. Yaxley gives his personal attention to the management of the entire plant and is at all times in touch with matters pertaining to both the shop and the office. In Mr. J. C. Hubacher, the secretary of the company, he has an unequaled assistant upon whom he can rely to work out his ideas to a state of mechanical perfection. Mr. Hubacher has not only had years of experience in the telephone business, but has

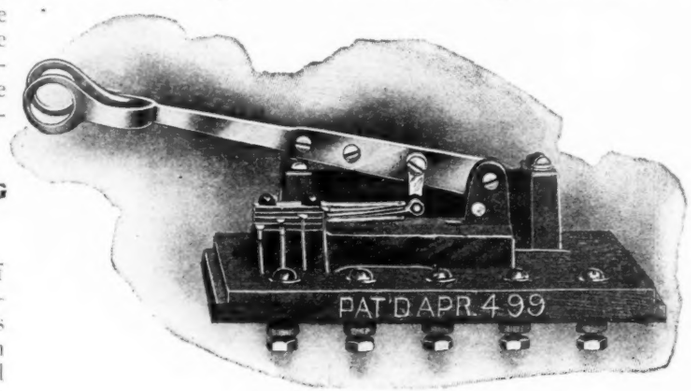


MONARCH GENERATOR.

been associated with a number of the best manufacturing companies in this city.

The president of this company, Mr. John E. Norling, is a well-known business man of Chicago and can be relied upon to give sound advice and lay out a safe business policy. Embodied in these three men, the officers of the company are the characteristics requisite to the building of a successful enterprise. They are ably assisted by their sales manager, Walter H. Trimm, who has entire charge of the sales and order departments. Although a young man, Mr. Trimm has had several years' experience in this line of work and the telephone public may be assured they will be justly and courteously treated by him.

There is one feature in connection with the growth of this company which is of particular interest. Starting out with the manufacture of but one part of a telephone instrument and meeting with such success as to give confidence to



MONARCH SWITCH HOOK.

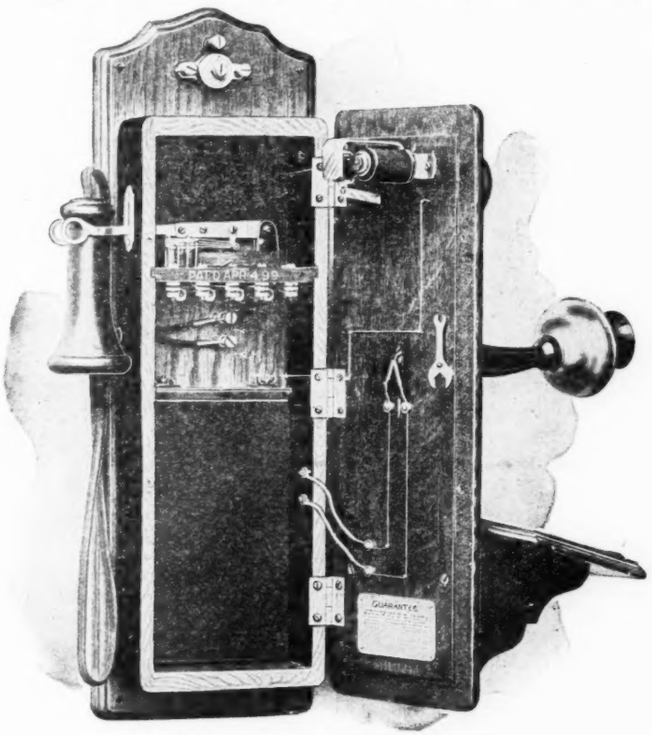
the officers, there has been a steady increase in manufacturing facilities so that to-day the company is making absolutely every part of the telephone it has placed upon the market.

The Monarch ringer was the piece of apparatus first designed and manufactured and since the completion of the first ringer, there have been over 350,000 of these parts sold. This is surely a gratifying record.

No sooner had the manufacture of the ringer been well established than the Monarch generator was ready for sale.

This part also met with wonderful success and has done a great deal to make Monarch apparatus popular. With the success of these two parts assured, the others followed in quick succession and it was not long before the company was making every piece of apparatus necessary for the assembly of an instrument. The natural consequence was the designing and placing upon the market of a complete telephone. Since that time there has been a steady increase in the demand for these instruments, as the practical telephone men throughout the country realized that a telephone made up of parts which had already proven themselves perfect in construction and perfect in operation, would naturally give reliable service.

In assembling the various parts into a complete telephone, Mr. Yaxley's ingenuity is shown. The generator, hook-switch and induction coil are mounted upon shelves in the usual manner, but these shelves are arranged so that they may be easily removed from the cabinet, thus placing parts in a position to be readily inspected or repaired. Directly



MONARCH COMPACT TELEPHONE.

beneath these shelves and fastened to them by means of lock-nut binding posts, are situated contact bars. These bars serve the double purpose of holding the shelves in place and of making connections to the various parts, as the permanent wiring of the instrument is brought to them and then through the binding posts to the generator, hook and coil. By loosening the nuts on the binding posts all of the connections are broken and at the same time the shelves are released so that they may be taken out. The advantages of such construction are easily appreciated, as a coil, generator or hook may be removed and replaced without taking the instrument from the wall. It is also impossible to make place and of making connections to the various parts, as each binding post is associated with its particular contact bar. In the accompanying illustration are shown the removable shelves with the parts mounted thereon. It will be seen how easily the generator shunt springs, hook switch contacts, or in fact, any of the parts, may be inspected.

Following out the original idea to have a complete line of telephones and to make every part of the instrument, the company has recently placed upon the market a new desk set and two new common battery wall sets. One of these is shown in the cut herewith and it will be noticed that it is very similar in design and construction to the well known compact type of local battery instrument. It embodies the same features of the removable shelf, upon which are placed the hook and coil. The condenser is mounted directly beneath the shelf and the ringer on the door, thus making all parts readily accessible.

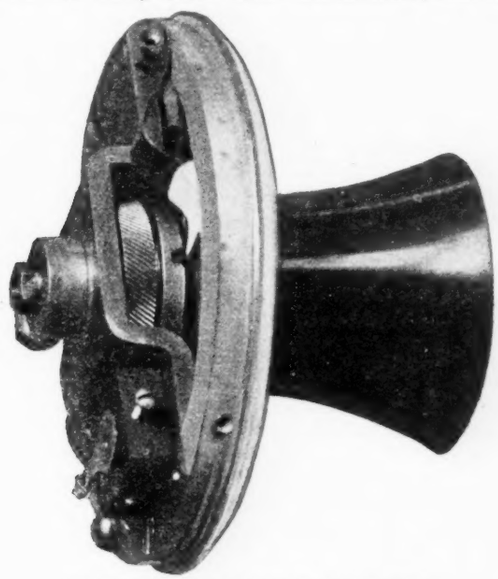
The other style of wall set is very similar in outward appearance to the common battery instruments manufactured by other companies, but several advantages in design and construction are claimed. The condenser in this set is mounted directly beneath and parallel to the writing shelf in a case prepared for it, so that when the cabinet is open the terminals are directly in view. The box holding the ringer, condenser and other parts is hinged at the bottom and falls forward when opened. The hook switch is mounted upon a shelf attached to the backboard and the induction coil is placed immediately above it. Both receiver and line binding posts are mounted within the box so there are no outside connections of any kind. Like all other Monarch apparatus, the instruments are well made and the workmanship is of the best.

This company deserves the success it has attained and reports indicate that its business is still increasing steadily.

CHICACO SOLID BACK TRANSMITTER.

In a letter to this publication describing the "Chicago Genuine Long Distance Solid Back Transmitter," the Chicago Telephone Supply Company of Elkhart, Indiana, make some strong claims for this new piece of transmitting apparatus. The communication follows.

"There are many solid back transmitters, but only one



CHICAGO SOLID BACK TRANSMITTER.

Chicago. The reasons why the Chicago gives such excellent service and is so long-lived, are so simple that they will be apparent to anyone who will take the trouble to examine its construction and compare the specifications with those of any other transmitter. Investigation is invited. The more thoroughly it is tried, the more popular it is.

"Point 1. The Chicago is built like a watch. Every part receives the utmost care in every process of production.

"Point 2. The auxiliary diaphragm is made of aluminum to secure uniformity. Mica is never uniform, hence its use is a mistake.

"Point 3. The bridge is very heavy, to insure rigidity and prevent vibration of any part except the front electrode.

"Point 4. The rear electrode is adjustable after the trans-

mitter is assembled. This feature insures a uniform maximum degree of efficiency. Without this adjustable feature, uniformity is impossible, because the most delicate method of measuring changes of carbon and distances between electrodes is infinitely crude and inadequate, when compared with the minute variations of sound waves which a transmitter must register. The human ear alone is competent to judge whether all of the necessary conditions are present to secure results. Only when the rear electrode is adjustable is it possible to utilize the human voice to secure uniformly the maximum of efficiency.

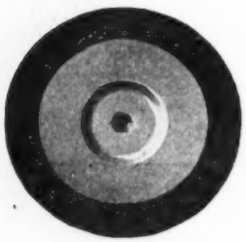
"Point 5. The heavy lug, utilized to attach the carbon

BACK VIEW.

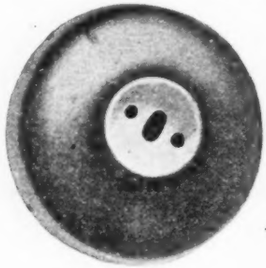
DAMPER SPRINGS.

chamber to the bridge, has such a long bearing that it is impossible for the centers of the electrodes and the diaphragm to get out of line. In many cases where the transmitter is out of service because it is "packed," the trouble really is caused by the centers of the electrodes and the diaphragm being out of line. In such cases it is impossible for the sound waves properly to register.

"This trouble may be caused by: First, a thin bridge; second, use of rubber bushing to insulate carbon chamber from



DIAPHRAGM.



BACK CUP.

bridge; third, failure to mill rim of front to receive bridge in exact position desired; fourth, failure to make every part with the care used in making the finest of watches.

"A few points of excellence have been mentioned. In other respects the Chicago will be made more popular by close scrutiny. The main diaphragm is made of frosted aluminum chambered to secure the best results. The damper springs are of the only pattern used on any successful transmitter. Variations from this form always prove to be

BUTTON.

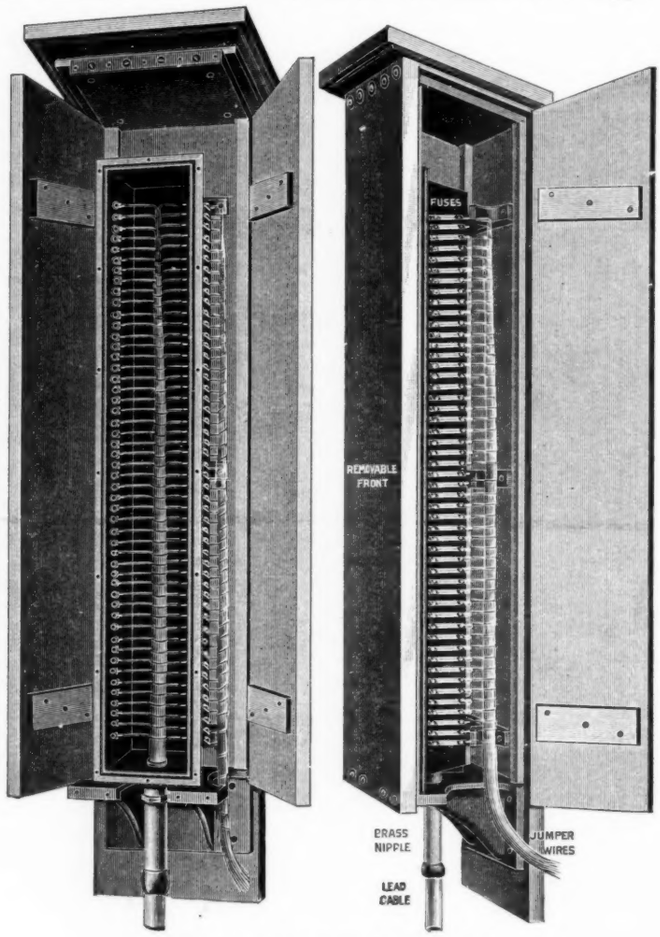
BRIDGE.

disastrous experiments. The front is heavy, and is finished with the finest of highly-polished nickel plate. Each and every front receives a plating of copper before being placed in the nickel bath. The carbon chamber, or "button," is heavy and moisture proof. The electrodes are imported from France, and specially polished by a process designed by our engineering department. The granular carbon is also imported from France, and is especially hard and highly polished. All carbon used will give perfect satisfaction in any kind of service, and will resist deterioration from the heaviest currents used in central energy work.

The time is fast approaching when any telephone system will be out of date where the transmitters are of any other type than the solid back. In securing transmitters of the solid back type, results will be insured if the merits of the Chicago are investigated. Without desire to disparage honorable competitors, we ask nothing but comparison of mechanical workmanship and electrical efficiency."

IMPROVED IRON POLE CABLE TERMINAL HEAD

The iron pole top cable terminal head with wood house outer covering being manufactured by the Williams-Abbott Electric Company, Cleveland, Ohio, is claimed to be the most complete all-iron terminal with fuse protector now on the market. At the bottom of the terminal a brass nipple



WILLIAMS-ABBOTT TERMINAL HEAD.

or sleeve for attaching a fifty-pair lead-encased cable is provided. The front is encased with an iron panel, firmly secured with machine screws, making a perfectly tight and moisture-proof joint with rubber gasket. The fuse clips are arranged on the sides of the terminal for attachment to jumper wires, a hole being left in the bottom of the terminal house on each side of the terminal for leading these wires. An outward swinging door is placed on each side of the terminal house, exposing to view all of the fuse clips and jumper wire connections, making them readily accessible for repairs, renewals or test. The terminal house is made of heavy pine, treated with three coats of lead paint, and is

firmly attached to the pole by means of an iron strap and bolts. This new terminal is made up either in fifty single wire or 100 single wire capacity as ordered. It is guaranteed by the manufacturer to give perfect satisfaction and is being furnished at a price which has already created a great demand for it. Full description and cuts describing the device in detail will be supplied upon application.

CHARLES G. STEVENS COMPANY CATALOGUE

Catalogue Number One issued by Charles G. Stevens Company, 58-60 South Canal street, Chicago, under date of September 1, 1903, is one of the most complete and finest of its kind which has come to this office. As its title implies it is a complete catalogue and stock list of hot and cold rolled steel and iron products and the hundred pages in the book are replete with illustrations, tables, and data of considerable value to the buyer of this product. The Charles G. Stevens Company do a large business with telephone manufacturers and represent the following mills: West Leechburg Steel & Tin Plate Company, Allegheny Steel and Iron Company, Frankford Steel Company, Philadelphia Forge Company, Hobson, Houghton & Company, Ltd., The Globe Wire Company, Ltd., Inter-State Steel Company, Washburn Wire Company. The company calls particular attention to complete lines of finished material it has for various manufacturing purposes. It carries in stock nearly all material listed, and is in position to make prompt shipments and quote interesting prices. The officers of the company are: Charles G. Stevens, president and treasurer; A. D. Dorman, vice-president and secretary, and W. N. Clyde, assistant secretary. The catalogue will be mailed free to those interested.

NEW ILLINOIS-WISCONSIN TELEPHONE LINES.

Evanston, Ill., has just awakened to the fact that it is about the only city in the state of Illinois which has not yet struck off the claws of the Bell telephone octopus. Three or four different parties now seem desirous of getting franchises in the classic suburb. Among those seeking favor is James E. Keelyn, known as the "Father of Independent telephony," who resides in Evanston. It appears that Mr. Keelyn has had this Chicago North Shore system under prospective organization for several years. For some months past he has been quietly perfecting his plans to connect the Chicago and Northern Illinois district with Wisconsin. The unexpected publication of his movements started others to action. This may make it more difficult for him, but there can be no further doubt of the establishment of a successful system Independent of the Bell, now that Mr. Keelyn has taken hold of the matter. His vigor and ability in this direction are well known, and, while the "opposition" may fight him hard, his many friends on the right side of the telephone question will confidently await his full success. There is no man better known in the telephone business nor anyone with more strong friends than Mr. Keelyn. Evanston is not only fortunate in having him as a citizen, but is to be congratulated in having him as a champion of its best interests.

THE ROEBLING CATALOGUE.

The Roebling product is illustrated and described in a catalogue of nearly two hundred pages, which has recently been issued by John A. Roebling's Sons Company, Trenton, N. J. The book is one of the most complete of its kind issued, and the illustrations are of more than ordinary interest, many of them being full page drawings. It is in reality an illustrated price list of wire rope and wire rope fastenings; iron, copper, brass and steel wire; galvanized telegraph wire and hard copper telephone wire, with descriptive notes on cableways and tramways, suspension bridges, transmission of power by wire rope, inclined planes, rope haulages, etc. The book will be sent free to prospective buyers upon request.

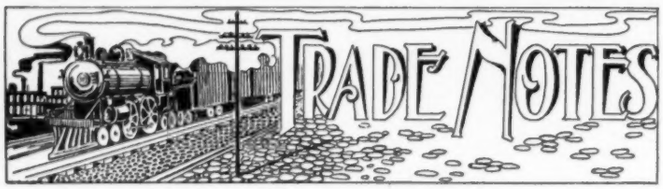
CAN THE GOVERNMENT DICTATE TELEPHONE RATES?

The question of whether or not the government has the right to dictate what rates shall be charged for telephone service is one of much interest, and has again been brought prominently before the public in Washington, says Electricity, this time by means of a decision which has just been handed down by Justice Barnard, of the District Supreme Court, which is not by any means a final disposition of the matter.

The Act giving rise to a lengthy and almost continuous litigation was that of June 30, 1898. The company's claim is that it cannot furnish the telephone service at the rates fixed by Congress, and that the Act was unconstitutional. This was coincided in by Justice Barnard's first decree, was reversed by the Court of Appeals, and was remanded back by the United States Supreme Court, with instruction that the investigation should be conducted in the light of the construction given by the Supreme Court to the statutes. On May 1, of the present year, an order was issued by the courts and consented to by the parties, to the effect that the case should be referred to an examiner, who should take evidence as to what classes of telephones, equipment and service were intended by the 1898 Act of Congress; after this had been secured a further hearing was to be given on the subject. This evidence was secured only upon the classes of material to be used and a hearing followed on that issue alone. The court was then asked to determine, as a preliminary matter, what kinds of telephones, equipment, and service was meant by Congress in the Act which established the rates to be charged.

Justice Barnard in his resumé of the case called attention to the fact that the question was to be answered from all the evidence adduced and also in the light of the construction given to the Act by the Supreme Court in the opinion handed down by Mr. Justice Brewer, in which practically only one question was left for the District Supreme Court to determine, and that was as to whether it was the intention of Congress to fix the rate to be charged under the Act for the less expensive and inferior equipment or for the more expensive and more reliable equipment, this to mean either telephones connected by single iron or steel wire, or "grounded circuits," or else those connected by double copper wire, or the "metallic circuit," the former being used for local communication only, while the latter is for long distance or local service. Justice Barnard takes the view that Congress only had a local service in contemplation when it passed the Act, the grounded circuit being the only system then in use in the District and that the Act does not apply to the long distance or metallic circuit with its more expensive and efficient equipment and service; and only this view of the case could be taken in view of the mandate of the Supreme Court, and the inquiry had to be proceeded with as if the Act had been expressly made to apply to the Blake transmitter one-call battery telephone and equipment with the usual and ordinary service for local communication.

Justice Barnard's decision gives the parties leave to apply for an order to take further evidence, and such application will be heard before any further proceedings are taken in the matter, although he stated, that had it not been for the stipulation and consent ordered he would have been compelled to sign a decree dismissing the bill, because the contract related to a class of telephones, equipment and service not within the provisions of the Act.



THOS. E. CLARK WIRELESS TELEGRAPH-TELEPHONE COMPANY, Detroit, is sending out a card on which is printed the Morse telegraph alphabet. The company asks that all interested send a two-cent stamp for Bulletins 8 and 9.

THE ELECTRIC APPLIANCE COMPANY, Chicago, is sending out samples of its O. K. duplex telephone wire. It is made in three colors: brown, maroon and black. Sample and prices will be gladly furnished on application.

THE MANHATTAN ELECTRICAL SUPPLY COMPANY, New York city, will be pleased to send, upon request, its catalogue No. 16. This contains illustrations and descriptions, as well as a price list, of electrical apparatus of every character.

THE WESCO SUPPLY COMPANY, St. Louis, Mo., is sending a number of leaflets to the trade illustrating and describing the specialties and supplies handled. These leaflets will be sent free to interested parties who make a request for same.

THE ELECTRIC GAS LIGHTING COMPANY, Boston, Mass., is sending out Bulletin No. 1, entitled "The Specializing of Interior Telephone Apparatus." This describes the details of the Samson telephone apparatus which this company is placing on the market.

AMERICAN MINIATURE AND DECORATIVE LAMP COMPANY, INC., New York, has recently published a folder on standard "Tipless" lamps. It gives some data and shows some reasons why the American lamp should be used. The company invites inquiries.

THE EMPIRE ELECTRIC SUPPLY COMPANY, 57 West Jackson boulevard, Chicago, announces a steadily increasing demand for the company's supplies and specialties and invites correspondence from prospective purchasers in the telephone and electrical field.

NATIONAL WIRE CORPORATION, New Haven, Conn., has issued under date of Nov. 1, a new telephone and telegraph wire price list, which combines the latest figures for this class of wire and the latest trade prices. Copies can be had on application by anyone interested.

THE WILLIAMS-ABBOTT ELECTRIC COMPANY, Cleveland, Ohio, is sending a folder to the trade illustrating and describing the company's new desk telephone and its new cam hook switch. This folder and other late advertising matter will be sent free to prospective purchasers.

THE CROWE METAL MANUFACTURING COMPANY, 71-77 West Jackson boulevard, Chicago, Ill., announces that it has taken over the entire business of the Bogue & Crowe Manufacturing Company, including good will, and is equipped to fill all orders promptly and guarantee satisfaction.

THE F. BISSELL COMPANY, Toledo, Ohio, is distributing throughout the electrical field a mailing card having attached to it a spider wire cleat for cable pole work and construction. This is of tough maple, held by screws or nails, and drilled for five wires for the full end of the cross-arm. When used with bridle rings this makes a holder for spider wires between the pole-houses and the insulators. The sample sent is for a small wire.

THE AUTOMATIC ELECTRIC COMPANY of Chicago has received an order from Bills Brothers for complete equipment of an automatic exchange of two thousand stations (initial installation) for Sioux City, Iowa. The exchange will have an ultimate capacity of ten thousand stations.

THE LAKE DIVIDED CAMP TILE is the latest innovation in conduits. It is manufactured by the H. B. Camp Company, New York, Pittsburg and Chicago, and is meeting with considerable favor from users of conduit. The company has recently issued a little folder illustrating and describing this new product which it will gladly mail upon request.

MILLED SCREWS is the title of a product catalogue issued by the National Acme Manufacturing Company, Cleveland, Ohio, which illustrates the company's line of set and cap screws, as well as its special goods. The catalogue is a very complete one and will be found of value to buyers of this kind of material. The company will mail the catalogue upon request.

COLUMBUS STORAGE BATTERY COMPANY, Columbus, Ohio, has just issued its third annual catalogue devoted to Columbus storage batteries. The catalogue gives a complete description of small cells of every description, together with a short treatise on "The use and care of storage batteries," which is of considerable interest. The catalogue may be obtained free by addressing the company.

THE CURRENT ISSUE of "Copper Gossip," issued by the National Conduit Cable Company, New York, contains the company's letter on the general business outlook, the copper market here and abroad with prices and some figures on the exports of copper, as well as other valuable data on copper. The company will gladly send "Copper Gossip" regularly to any interested parties free upon request.

MCROY CLAY WORKS, Chicago, Ill., and Brazil, Ind., has recently issued an attractive booklet illustrating and describing the company's product. The title of the booklet is "Fifty Million Feet Under Ground." The engravings used are the finest and it is in every way a work of art. Those who use conduits will find much of interest in the book, which will be mailed free by the company upon request.

CAST IRON CABINETS for interior and central energy telephones is the title of a booklet issued by "Bararm," which means the W. J. Barr Manufacturing Company of Cleveland, Ohio. The cabinets described and illustrated in the booklet are indestructible, beautifully finished and serviceable. This company is one of the most progressive and has a number of new devices which will interest telephone men. Correspondence is invited.

THE WESTERN TELEPHONE MANUFACTURING COMPANY has been occupied greatly during the past year making up a number of new designs of instruments and central office devices. These have required a large number of cuts to illustrate them properly. A new catalogue is being prepared for circulation Jan. 1, 1904, which promises to have some features of value to every telephone buyer. It will be mailed to applicants as soon as printed.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Chicago, Ill., and Rochester, N. Y., reports that its underground cable department at Rochester is running at its full capacity. A recent shipment of 60,000 feet of underground cable was made to the Keystone Telephone Company, Philadelphia, Pa. It is stated that this cable is

a most excellent product. The company has facilities for making cable according to any specification submitted.

"Wires, Cable and Cordage" is the title of Bulletin No. 6 issued by the F. Bissell Company, Toledo, Ohio. This bulletin is meant as a perpetual catalogue. It contains complete wire tables and is fully illustrated. This company makes a specialty of wire and cable and can quote interesting prices on same, as well as on general telephone and electrical supplies. Correspondence solicited.

The Blaine Land Anchor is described in a booklet recently issued by the Attica Foundry and Machine Company of Attica, Ohio. The illustrations show the anchor in position and method of placing same in ground. The company claims the "Blaine" is the cheapest anchor and best method, as it pulls against the solid earth from the start. The book gives a clear idea of the anchor and will be mailed to any one interested.

The Lambert Schmidt Telephone Manufacturing Company, Weehawken, N. J., has recently installed in the new Butterick Building, New York, a 120-drop telephone switchboard, common-battery system. The New Amsterdam Theater and the New York Theater have recently been equipped with the Schmidt automatic intercommunicating telephone system. Other contracts just closed are equipments for the adjutant general's office and bureau of ordnance in Washington, D. C.

The American Electric Telephone Company, Chicago, Ill., announces the following list of exchanges which it has recently equipped with apparatus of the regular express switchboard as well as the Bell express types of central office equipment: Kingman, Ariz., 150-line express; Trenton, Mo., 100-line express; Chillicothe, Tex., 25-line toll board; Lancaster, Mo., 100-line express; West Point, Ky. (U. S. Signal Office), 50-line Bell express; Elmwood, Ill., 320-line Bell express; Mebane, Mo., 8-line toll board; Everest, Kan., 100-line express.

The Eureka Electric Company, Chicago and Genoa, has just closed contracts for immediate shipment of a large consignment of telephone apparatus for installation in the Philippine Islands. The Eureka company has recently made four shipments of apparatus to foreign countries, the total distance from home being upwards of 25,000 miles. Not alone does the Eureka apparatus enjoy an enviable reputation in this country, but abroad as well. The Government of Salvador has just placed another contract for a large shipment with this company after having used and endorsed its apparatus for the last five years.

The Warren Adjustable Fixtures is the title of a little booklet being issued by the Illinois Electric Company, Chicago. Among the other late advertising matter issued by the company is a revised net price list and discount sheet applying to catalogue No. 15. This includes high-grade telephone construction material and specialties. The leaflets issued are "The Improved Illinois Pole Changer," "Peirce Cross Connecting Panels," "Ericsson Switchboard Cord," "The Peirce Fuse," "Sand's Duplex Desk Telephone Bracket," "Sand's Electric Soldering Iron," "Condinuous Current Voltmeters, Ammeters and Volt-Ammeters," etc. The entire line of advertising matter will be sent free by the company upon request.

The Eureka Electric Company at its new factory, Genoa, Ill., has just perfected improved apparatus for the purpose of testing its generators and in addition to the testing of the generators it has devised a very ingenious instrument for the purpose of testing and computing lines of force obtained in a magneto generator magnet. By this method, the company claims to manufacture each and every generator exactly alike. The method of testing is as follows: After assembling the generator, it is tested for milamperes output and then its voltage, and any machine falling below a given standard is rejected. Before the magnets reach the assembling room, after being magnetized, they are tested for lines of force, or in other words, strength in magnetism.

The company is now distributing its new 26 and 27 bulletins, describing its line of apparatus; also its new catalogue, No. 23.

The Swedish-American Telephone Company, whose advertisement appears on page — of this issue, has recently closed contracts with the following-named telephone organizations for complete equipment: People's Mutual Telephone Company, Braymer, Mo.; Independent Telephone Company, Rulo, Neb.; People's Mutual Telephone Company, Sheffield, Iowa; Graettinger Telephone Company, Graettinger, Iowa; Higdon Telephone Company, Kingston, Mo.; Stevens County Telephone Company, Hancock, Minn.; Farmers' Telephone Company, Hamlin, Kan.; Farmers' Telephone Company, Crowles, Neb.; Chetek Telephone Company, Chetek, Wis., and Peninsular Telephone and Telegraph Company, Ensanada, Mexico. The Swedish-American Telephone Company will be pleased to forward its recently published up-to-date catalogue to any one interested.

A New Catalogue of telephones and supplies has recently been issued by the B.-R. Electric and Telephone Manufacturing Company, Kansas City, Mo., which is from many points of view entitled to rank as one of the finest that has made its appearance this year. The book contains 132 pages, is printed on heavy paper with embossed covers and reflects great credit upon the firm as well as its compiler, Mr. A. E. Dobbs. From the opening pages we learn that the firm occupies 43,000 square feet of floor space and that it handled 150,000 pounds of telephone wire last year, which alone would indicate that it is entitled to a place among the largest supply houses west of Chicago.

The opening pages of the catalogue proper contain several fine half-tone cuts of telephones made by the company, followed by a set of specifications for building and connecting telephone lines and a list of their troubles.

The company has always been noted for its fairness, energy and enterprise, and if the present catalogue is any criterion by which to judge, it will procure its share of the western trade.

F. W. Pardee, corresponding secretary of the Chicago Writing Machine Company, manufacturers of the Adjustaphone, has left for St. Louis to arrange for the company's exhibit of Adjustaphones and other telephone apparatus at the coming exposition. He will also make arrangements with telephone manufacturers in St. Louis and vicinity to handle the Adjustaphone and will call on various telephone companies from whom inquiries have been received. The Chicago Writing Machine Company reports that arrangements have been made with practically all of the largest telephone manufacturers, and orders have been received from telephone exchanges from almost every state in the country. Among the manufacturers who now handle these instruments, mounting their own transmitters and receivers, are the Kellogg Switchboard and Supply Company, the Stromberg-Carlson Telephone Manufacturing Company, the Eureka Electric Company, the American Electric Telephone Company and the Swedish-American Telephone Company, all with offices in Chicago. The Fort Dodge Telephone Company of Fort Dodge, Iowa, has installed the Adjusta-

phone and reports that it is absolutely satisfactory and that users are very much pleased with it.

THAT the International Telephone Manufacturing Company of Chicago is receiving the unqualified indorsement of the operating field in its efforts to furnish a type of apparatus which meets the most exacting requirements is evidenced by the following recent shipments: One new-type mechanical self-restoring drop switchboard, 150-capacity, and telephones to D. S. Thomas, Madison, Mo., and a similar order for completely equipped 100-capacity board and telephones for a new telephone exchange at Bevier, Mo.; a chief operator's desk and 100-capacity addition to the 500-equipped board at Moberly, Mo., together with telephones and incidental supplies; and a 50-capacity board and telephones to E. O. Shuman, Jacksonville, Fla. The International has a number of additional orders on its books for new express type boards in various capacities, ranging from 100 to 600 lines. It is claimed that this board has many new features which make it exceedingly rapid of operation, one operator being able to handle from 200 to 300 subscribers with ease under ordinary conditions.

THE LIST of small exchange switchboard shipments which follows cover shipments made by the American Electric Telephone Company of Chicago, during the past thirty days, and embraces only a small exchange type of equipment. Among the shipments not listed are included two multiple switchboards and a large number of common battery shipments: Palmyra, Ill., one 200 line Express; Wabasha, Minn., two 100 line Express; Ozark, Ark., one 100 line Express; Germantown, O., one 100 line Express; Murray, Ia., one 200 line Express; Orlando, Fla., one 200 line Express; Belleville, Kans., one 100 line Express; Elk City, Okla., one 100 line Express; Burlington, Ia., one 160 line Express; Carey, O., one 100 line Express; Chickasha, Ind. Ter., one 100 line Express; Knox City, Mo., one 100 line Express; Richland, Mo., one 200 line Express; Herkimer, N. Y., one 100 line Express; Courtland, Kans., one 100 line Express; Richmond, Ind., two 100 line Express; Archie, Mo., two 100 line Express; Hundred, W. Va., one 100 line Express; Sheboygan Falls, Wis., one 100 line Express; Pottsdam, N. Y., one 100 line Express; Marion, Ill., two line Express; Star City, Ind., one 100 line Express; Winchester, Kans., one 100 line Express; Monclova Coah, Mex., one 100 line Express; Nebraska City, Neb., one 100 line Express; Deming, N. M., Luna County T. Co., one 100 line Express; Harris, Ia., one 100 line Express.

THE STANDARD POLE AND TIE COMPANY, 133 Front street, New York, is introducing a cypress pole, as it introduced the juniper pole some four or five years ago. For the last half century the juniper or Southern white cedar has been used in the South extensively, but the Standard Pole and Tie Company has made it a point to advertise and thoroughly introduce it in the North. This company recognized the superior quality of the juniper and decided to push it, with a result that it has become known throughout all the states as a standard of quality among poles. The company's best customers are the street railway companies, to whom it has sold over 100,000 in the last two years. The telephone companies and electric light companies alone, however, send enough orders to keep any small concern busy. For some time the company has been experimenting with the cypress. This, like juniper, is a Southern swamp growth. Both are free from butt rot, have exceedingly close grain and a remarkably small percentage of sap wood. The cypress, however, is naturally very heavy; so heavy, in fact, that the company thought it impossible to use it as a pole on account of the freight. By careful tests it has been found that by girdling the tree some three weeks before it is cut, and then keeping it entirely out of the water until it has seasoned for sixty days, the weight is decreased nearly one-third. This renders the pole marketable. It is the intention of the Standard Pole and Tie Company to push the cypress pole as it has pushed the juniper, and it no doubt will meet with equal success.

NORSTROM LOCK-OUT TELEPHONE MANUFACTURING COMPANY, 141 South Clinton street, Chicago, has recently mailed a little pamphlet describing the Norstrom improved lock-out and party-line telephone system. The company in discussing the device says:

"This is no experiment; our factory is running, and we will send our telephones to responsible parties on thirty days' trial.

"Any number may be put on a metallic line.

"When a party at a telephone station calls up central it does not ring any other bell along the line—doesn't even tap a bell. When the operator at central calls one or more stations it only rings the party or parties wanted. The ringing is done automatically, so that the operator does not need to go back on the line to ring. It also shows a busy signal when line is busy.

"When any one is using the telephone no one can overhear the conversation nor interfere in any way with the parties using the line. Should the operator wish, however, she can disconnect the parties using the line, and no one else has any control of it except the operator. Furthermore, none of the telephone stations can in any way be cut out. They can always get central. If any one holds the line it will not prevent the other stations from getting central. In fact, it is impossible to get the line in such shape that it locks out any of the stations.

"This lock-out can be attached to any standard make of telephone."

The company also manufactures a full line of series, bridging and central energy type. Correspondence is solicited.

RURAL TELEPHONES—SOME AMUSING COMPLICATIONS.

"The introduction of the telephone into the rural districts has produced many amusing as well as irritating incidents," said an inspector for the country division of a telephone company. "During the summer and fall I assisted in the installation of several circuits, and looked after them for some time following. I was half amused and half angry during the whole period, and I don't really know now whether I enjoyed the work or not. The people were eager to accept the telephone, but their ignorance regarding its use gave us some trouble at first. However, they soon learned to use the instruments and then the real trouble and fun began. One of our circuits, which supplied about twenty subscribers, kept me on the run for some time. Shortly after it had been put in operation, complaints as to inability to get connection with a part of the line came in, and I started out to find the cause of the trouble. I ran it down to the house of a certain farmer, and when I called the trouble was apparent as soon as he took me into the living room. There sat his wife in a rocking chair. She was sewing and tied to the back of the chair was the receiver of the telephone, so adjusted that she could place her ear to it without changing her position. Of course this cut off the subscribers beyond her, but it enabled her to hear the gossip of her neighbors at the other end. 'Yes,' she said, 'it is a comfort to hear what the neighbors are saying, and I can go right on with my work at the same time.' I remonstrated with them for this interruption of business, and they became indignant. They said they paid for the telephone and had a right to use it as they pleased. It took me some time to explain things, and I left them dissatisfied. The curiosity which possessed the people of this line was astonishing. Calling up a number and listening intent-

ly, you could hear the click, click of several instruments as their neighbors cut in to hear what was said. Sometimes an eavesdropper would become so interested as to interrupt and join in the conversation. Two waggish young farmers, aware of the fact that several persons were listening, shamelessly talked of a mythical incident prepared for the purpose, and the result was to set the whole neighborhood by the ears and almost produce a slander suit. One day I received a complaint that it was impossible to get a response from a certain subscriber, so I rode out to visit him. I found the telephone bell muffled with a handkerchief, so that it emitted no sound. 'You see,' said the mistress of the house, 'the noise of that bell awakes the baby, so I just fixed it that way. When I want to talk to anyone I take out the handkerchief.' 'But,' I remonstrated, 'when anyone wants to talk to you he can't attract your attention.' 'Sure enough,' she said, 'but I never thought of that.' A break in the line occurred one day, and after considerable search I found it at a crossing where it had been broken by a farmer with a load of hay. He had repaired the break satisfactorily to himself by tying the ends of the broken wire together with binding twine. When I took him to task for breaking the wire, he excused himself by saying: 'I mended it right away. It wasn't open ten minutes.' A short circuit being reported one day, I went out to find it. I found it at the house of a subscriber whose family used the instrument as a sort of bracket shelf on which to keep odds and ends. Among other things it contained was a harmonica, which was placed so as to connect the binding posts of the instrument. The metal sides of the harp made a conductor which did the business. A farmer complained one day that his instrument failed to work at times. 'It seems to take a sort of lay-off every Monday,' he said. 'Other days it works all right.' So the next Monday I visited him. I discovered the trouble immediately. It was wash day and the wires leading from the main line to the house were being used as a clothes line. The wet, heavy clothes thrown across the wires spoiled the circuit. It was only on washing day that this trouble occurred. As people grew accustomed to the instrument and ceased to be afraid of it, troubles frequently arose through the curiosity of the children, who loosened screws and drew out the wires. On one occasion the wire was filed through by a couple of boys, who disputed as to the size of the hole it contained, they being under the impression that the wire was hollow. 'How silly,' I remarked, when the cause of the break was explained to me. 'How,' asked one of the boys, 'can you talk through a wire unless it is hollow?'

"The use of the system for some time produced rows among people. On these circuits as many as twenty subscribers used the same wire, and each seemed to think he had the right of way, and a farmer impatient to learn the price of hogs would sometimes break into a conversation between two girls gossiping over the last picnic and feel himself perfectly justified, although the girls might feel otherwise. Of course trouble followed. It is not that country people are so much different from city residents, but the conditions on country and city systems are different. Each subscriber being isolated has fewer opportunities for discussing the telephone and must have time to learn the methods and to ascertain his own rights and the rights of others. On the older rural lines there is probably less trouble, but until experience has brought its results, the rural telephone inspectors will have a hard time."—*Canadian Engineer.*

Lieutenant Ljungmann, a Swedish officer, has invented a pocket telephone. Experiments conducted in Vienna recently by policemen from the central police station sent out with the pocket apparatus prove it to be of relative merit. An instantaneous connection was established with headquarters by applying it to the fire alarm boxes. The apparatus, which is no larger than a cigarette case, has been adopted by the Vienna police.

THE FALLER INVENTIONS.

In the December number of *Cent per Cent*, published by Mitchell, Schiller & Barnes, New York, the editor will say:

In respect to the value of the Faller automatic and semi-automatic telephone operators there are just two considerations governing the whole matter.

These considerations are (1) the demonstrated fact that competition is the life of trade and (2) the undeniable tendency of the times to effect all labor by means of mechanical appliances.

A brief review of these two considerations will demonstrate the absolute dominating importance of the Faller inventions in the field of telephony.

There have been arguments pro and con regarding the relative efficiency of single versus diversified telephone service, as is the experience of any departure necessitated by the march of time. Guttenberg, Galileo, Palissy, Columbus, Fulton, are sufficiently luminous as rearrangers of things to demonstrate that of two sides to a contention only one side, and that the one effecting great economies with attendant greater usefulness, can prevail.

It is but natural that the battle for singleness of control of telephonic service should be hotly waged. It is not only in line with all precedent, but such elimination of competition is important to certain interests. There are large interests, however, disputing the point.

In New York City, for instance, there is one telephone subscriber to every 500 of population. There is but one telephone company serving New York. In some western towns the ratio often raises to one in twelve, and these towns, many of them quite small, often support two (or competitive) telephone companies. Again, New York City, ten times the size of San Francisco, has only four times as many telephones, when its varied business and social importance demand that it should have not merely an equal proportion, but a use of telephones *at least ten times greater* than the ratio of *any other city.*

Another statistician tells us that less than 2 per cent of the residences in this metropolis and less than 12 per cent of the business houses have telephones, and yet the company operating here pays its 10 per cent annual dividends and frequently declares extra dividends. Continuing with the illustration we learn that rates of service in New York, with no competition, range up to 12½ cents per call, and seldom, even on the largest contracts, fall below 6 cents. A very careful estimate shows that the present or a new Independent company could do business in this city profitably at 5 cents to 2½ cents per call. These lower figures, it is interesting to learn, are based upon the employment of apparatus performing a far larger percentage of the work automatically than is now employed by the present company.

The editor of *Cent per Cent* refers to statistics to show what telephone competition has done in the matter of rates, but TELEPHONY has devoted so much space to this subject that its readers will not be surprised to learn that *Cent per Cent's* editor has concluded that "where competitive service has been installed, operating under more economical expense and less internal disadvantages and showing every desire to please its patrons, it has succeeded in building up the larger local system." He further concludes:

In all towns where there are competing telephone companies it has been found that the interests of the town have advanced correspondingly to the increase of use of the telephone. Why should it not? Both sides use as an argument for business "the telephone helps business," and even the least observant and least interested of the public know this.

Now granting competition to be beneficial, the question of greater relative efficiency, confronting both parties, becomes also of much concern to users of the instrument.

Coming down to figures, let us consider first, that there are about 35,000 telephone operators employed at present in the exchanges of the United States, and that the wages of this vast and rapidly increasing army is computed (on a very conservative basis) at $25 each per month, or $300 per annum.

This one item alone amounts to more than ten million dollars annually, even at the low figure stated, while accurate information shows the actual cost of operators in large cities to run from $8 to $10 per year, per telephone.

The operator's salary is not all; great expense is also incurred for other items. For instance, in a typical New York exchange, the entire fifth floor of the exchange building is utilized wholly for the operators' quarters, consisting of locker rooms, infirmary, reading rooms and dining rooms, etc.; these, a school of instruction and other expenses incidental to the employment of human operators, add considerably to the cost of operation.

The particular instances above given represent the largest items

of fixed expense, and these items under the present system of operating will increase with the increase of business.

In all other businesses the rule is the greater the volume of business, the lower the cost and consequently the lower the selling prices, But, owing to the very complicated "multiple" switchboard apparatus used to-day by the telephone companies, with attendant demand for floor space and human operators, there can be no profitable lowering of rates where large exchanges grow larger.

Why this is so, is clear to those who have a technical or working knowledge of the processes of telephony. To explain in detail for popular comprehension would require much more space than this periodical affords. It will probably suffice to say that expenses connected with present switchboard operation do not increase in equal proportion, but in this wise:

A station with 1,000 subscribers requires 6,000 "multiples" or "jacks" to make ordinary connections, and to attend to this ten girls (operators) are required in the day time and two at night.

A station ten times as large will require not merely ten times as many "jacks" or connections, but owing to the complicated nature of the "multiple" system now in use, will require 510,000 "jacks," or *eighty-five times as many as an exchange one-tenth its size*. There will also be required 150 day girls and fifty night girls, not to mention a like increase in the number of assistant engineers, helpers, etc., or the increase of other mechanism, apparatus, wire, etc.

But these, by all means greatest, items of expense can be reduced, and very materially, by following the trend of the times and eliminating or reducing the expensive and uncertain human element, substituting therefor automatic devices lessening fixed charges and increasing efficiency.

In telephony the agent that will produce this economical evolution—or revolution—is the Faller automatic telephone operator, and also, in a different but equally important degree the same inventor's semi-automatic operator.

The first, or automatic, entirely supersedes the inside mechanism of an exchange, dispenses with human operators, works quicker, with absolute secrecy and reliability, and requires less housing, decreasing all other expenses in proportion. We will consider each briefly hereafter.

An official speaking for a proposed new telephone company (this was about the time the machine was first brought to the attention of the telephone world) said "if it can be used it will increase the net earnings of the company 30 to 40 per cent, besides saving about 20 per cent in cost of original construction."

Since this opinion the machine has been demonstrated mechanically, electrically and commercially practicable and reliable and to achieve *more* than the expert quoted estimated.

William J. Hammer, an electrical engineer of international prominence, in addressing that body, declared Mr. Faller's operator "one of the most important and interesting inventions ever brought before the American Institute of Electrical Engineers."

A prominent consulting electrical engineer speaks of the Faller apparatus in the following manner:

"The Faller Mechanical Operator is eminently qualified to perform automatically by light machinery driven by any service of power, the functions of the human operator, moving mechanically the equivalents of the usual plugs and cords of an ordinary transfer switchboard, connecting subscriber's terminals together when desired, and disconnecting same automatically when parties have finished speaking, and accomplishing this without necessitating radical departures from the general arrangement of circuit met with in present standard practice; and doing away with all but a fraction of the relays magnets, electrical contacts, and connections essential in all other systems, both manual and automatic."

The semi-automatic operator, while not displacing the present "multiple" apparatus, works in harmony with it and increases many times its field of usefulness and that of the human operator, one of whom would be able to do the work of four under present conditions; and at the same time serve as a stepping stone for the installation of the fully automatic operator. Commencing with this the adopting company is not obliged to discard outright its entire equipment of expensive and frequently quite new apparatus, but, with the increase of range of present apparatus thus effected can materially reduce operating expenses and improve the service immediately, gradually replacing with the automatic as it becomes able to do so.

Some idea of the economy that may be thus effected might be stated thus: In a 10,000 subscriber exchange the adoption of the Faller Semi-Automatic device would save the cost of 490,000 (of the 510,000) "jacks" to a new company or set aside that many for future expansion to a growing company. At 25c each these would amount to $122,500. There would also be saved or laid aside, as the case may be, 10,000 relays at $2.50 each, $5,000 worth of cables, 200 transmitters at $1.50, and 150 receivers at 70c, a grand total of $152,905, to which must be added a further saving of say $40,000 annually in operators' wages.

The Faller Automatic operator would save not only all the complex "multiple" apparatus now required, but needs but a small fraction of the housing space now necessary, dispenses with all operators' wages and contingent expenses, requires practically nothing for maintenance and far less than present costs for extensions.

Both systems work much quicker than as at present with human agencies furnishing the connection called for, are absolutely secret and cannot err. Their operation is also easier for the telephone user than at present.

Still better. It has been shown that, as at present conducted, expenses grow with the increase of business; and it has been shown wherein tremendous savings can be effected. But the force of the illustration will be felt most when one considers that with the Faller Automatic Operator it is immaterial whether a subscriber calls 1, 25 or 100 times, or even oftener, per day and that low "flat" rates could be made accordingly, affording a sharp contrast to cost under the present system.

The Faller inventions it will be seen, are thus in a position to dominate the entire field of telephony—through the two mechanical operators, which alone, of all the inventions along these lines, have been proven faultless and highly successful from any point of view.

Reference to the advertisements of the Faller Automatic Telephone Exchange Company that have appeared in TELEPHONY during the past few months will disclose where the editor of *Cent per Cent* has procured his information regarding the Faller inventions. Eminent engineers, men who are prominently identified with Independent telephony, and have seen the Faller Operator in its earlier stages of development, have declared that the device was clever even in an embryonic state, but that it would require a vast amount of time to make it a factor to be dealt with in competition. These same engineers have also intimated that the "machine" was ingenious and embodied in a crude fashion the essentials that might be developed later, making the apparatus wholly practical. TELEPHONY is not familiar with the Faller inventions beyond the claims of the company now manufacturing the apparatus. These claims are so startling that except one observes and understands the marvelously increasing demand for telephones, it could hardly be considered reasonable that such a revolution is claimed by the manufacturer of the Faller Operators is actually at hand. But when we know that the people of the United States have in seven years put in about eight times as many telephones as the Bell had after seventeen years of monopoly, and are now going on with geometrically increasing ratio of demands, then we see that all improvements, great and small must immediately be investigated and exploited in the interest of the people who have been demanding "revolutionary" devices.

The Independent manufacturer deserves and receives great credit for fighting the Bell, yet it must be remembered that the demand for telephones has made it possible for the manufacturer to take up the burden and incur the risk that he has.

If, however, the claims of the Faller Automatic Telephone Exchange Company are founded upon fact, it seems but natural that new conditions are now confronting the manufacturer of manuel apparatus, and that the Faller devices hold more than passing interest for him. The people that have been responsible for the success of the present manufacturers will, in the event the Faller claims are substantiated, in all probability, demand the "revolutionary" idea.

So far as TELEPHONY is concerned we should not now deny the necessity for improvement any more than one should have denied the first claim for telephony for electric generators, for electric motors, or for the X-ray.

The public anticipates and expects these radical departures. The people who are to be served, if they are interested, should, therefore, call upon the Faller company for the evidence which we are led to believe it has in substantiating the truth of its claims.

SUBMARINE TELEPHONE RECEIVER.

A striking illustration of the way in which every new discovery in war is neutralized by another, is the invention of a sort of submarine telephone receiver, by which the slightest sounds can be heard through water for several

miles. The inventor says that he can absolutely prevent collisions in a fog; but the great design of the invention is to give warships warning of the approach of submarine torpedo boats. If the invention were absolutely successful, and did all the inventor claims for it, it would be as difficult for a submarine as for a surface torpedo boat to approach a warship that kept proper watch. All these mutually destructive inventions in naval war tend to reduce it back to the primal element of speed and fighting power in the ship, and skill and courage in the sailorman.

PUTTING IN THE TELEPHONE.

"James," said Mrs. Shumaker, "the telephone men have come to see about putting in the telephone."

"Very well," said Shumaker with that exasperating indifference to domestic crisis that has driven many a woman to an early grave. And he returned to his newspaper.

"But where shall we have it put?"

"Any old place, my dear."

"But, James," said Mrs. Shumaker with an intonation that her husband knew, "I have asked you for days where to have that telephone put and it isn't decided yet."

"Well, isn't that just a little your fault my dear?" asked Shumaker. "Every time you have asked me I have said it should be put in the rear of the hall. That spot really does, in spite of constant and unexplained objection, appeal to me as the very place where it might best hang to suit your convenience—everybody's convenience."

Mrs. Shumaker sniffed contemptuously. "What if burglars were to come? How could we possibly get down there in the night? One of the chief reasons for having the thing put in is for burglar protection. Suppose a fire started in the cellar and our escape from upstairs was cut off, how could we get down stairs to summon the fire department?"

"Well," said Shumaker wearily, "if you prefer upstairs, for goodness sake have it placed up stairs and let the matter drop. The thing is for your convenience, and if you feel it is for your convenience to trot up a flight of stairs whenever the telephone bell tinkles far be it from me to suggest the rear of the downstairs hall again."

"Of course," said Mrs. Shumaker thoughtfully, "I would have to run upstairs every time the bell rang if I have it put upstairs, and that might grow tiresome. But then it ought to be there if burglars ever"——

"My dear," said Shumaker, "we have been keeping house about fifteen years now, haven't we?"

"Yes," said Mrs. Shumaker, with some doubt in her voice—doubt of his ultimate purpose in asking the question.

"And in all that time has anyone ever rattled our front doorknob even with a view of getting in unless that person had a legitimate right"——

"Nonsense!" said Mrs. Shumaker. "They may get in tonight and take everything we've managed to accumulate during those fifteen years you speak of. Well, if upstairs won't do why don't you suggest somewhere else."

"That's easy. I suggest the rear of the downstairs hall."

"James, I shall scream if you continue to talk about that perfectly impossible place. Why will you be so provoking?"

"I have no other place to suggest. I am willing—even anxious—that you should suit yourself about it, anyway."

"But you won't help me a bit?"

"Now you just choose a spot for yourself and hang that blamed thing on it for ornament or use, just as you desire. Consider the roof, the bath-tub, under the kitchen sink"——

"James, you are perfectly useless. I had to work like a mad woman to get your consent to have that modern convenience here and I have all the trouble of getting it placed, and when I come to you for help all you say is 'rear of the hall.'"

Shumaker whistled softly. "Because you asked me the best place as I view the situation and I tell you what I consider the best place. Here comes the telephone man. Now you let him settle the matter for you and then in the future you blame him if things don't suit you."

Shumaker was still whistling softly when his wife asked and the man answered the crucial question. But he stopped in time to hear his wife's reply.

"Certainly," she said, "that's what we have decided on. It will be hidden by the stairs and it would be very inconvenient to have it upstairs. In the rear of the hall, then."

Shumaker began to whistle again, softly and slowly but meeting his wife's steely eye, he got up quietly and started downtown.—Chicago Daily News.

AN ALASKA TELEPHONE SYSTEM.

Close upon the train of the pioneer in any new country follows the railroad and the telephone. Each in its own way assists materially in the development of that country, and each contributes to the ultimate success of the community. Both are often constructed in the face of many difficulties, and none more so than those which confronted A. E. Boyd when he installed a long distance telephone line on the Seward peninsula in Alaska.

Late in the fall of 1901 the first holes were dug in the ground and the first poles were set up. Through Nome and across the tundra toward Council City the wire was stretched and by January 1, 1902, had reached Solomon, thirty-five miles away, and the line was opened to the public. During the following summer the work was completed to Council City.

Various extensions have been completed as rapidly as conditions would permit. Soon after the line reached Council City it was extended to Ophir Creek, eight miles distant; thence on to Craft's roadhouse and thence to White Mountain. Within the last few months work has been done on an extension to reach to Golovin Bay, and of the thirty miles necessary for its completion twenty-three miles have been finished. In all the long distance telephone line does service over 150 miles of wire.

All of this entailed much arduous labor. In many instances the poles had to be hauled as far as eighty miles; towers were constructed at either end of long spans crossing creeks and rivers and holes had to be dug in the frozen ground. That the work was well and faithfully performed is evinced by the fact that even in the severest weather and in all seasons of the year the construction has never failed to stand the strains to which it has been subjected.

At Port Safety harbor a single wire 1,500 feet long crosses the water and at each end is supported by towers eighty-five feet high. Never has a break occurred in this unusually long span from natural causes. Once or twice, when the supporting towers were several feet lower, the masts and smokestacks of passing steamers caused a break which was speedily repaired—but even this danger is now obviated.

The line runs along the route followed by the winter trail to Council City, and in all of the roadhouses public telephone booths have been placed. This has been of great service to the miner and to the traveler. The apparatus for this entire system was furnished by the Chicago Telephone Supply Company of Elkhart, Indiana.

The feat of telephoning to Chicago from a balloon 1,600 feet up in the air and over forty miles away was recently carried out successfully at Zion City. T. E. Anderson, who made the ascent to take a birdseye photograph, took up a telephone, the wire running down the cable that held the balloon. When he had attained full height he talked with his employer, George R. Lawrence, in Chicago and also with Zion City people.

All on Account of His Wife*

GEORGE A. BRIGGS

Frank Henderson was a man who had learned life's lesson of economy and hard work. Year after year he had made plans for a more comfortable and easier life, but fate seemed inexorable, and all of his earnings and profits were annually consumed by improvements and the necessary expenses of his farm. At thirty-five years of age his lot was no easier than when he first faced the battle of life for himself at the age of twenty-one.

For fourteen years, circumstances had delayed the fulfilment of his earlier hopes. In the beginning, self-sacrifice and drudgery had seemed but temporary necessities which would lead to better things; and better things had come in the way of larger barns, more acres of land, and larger herds, bringing greater opportunities for further self-denial. But the first hopes of his younger manhood were either forgotten or were so deeply buried in the arduous duties of his daily life that they had no chance to rise to the surface. The buoyant hopefulness which had won for him the kindly feelings of everyone and had enabled him to win for himself the sweetest girl in the township, was now but faintly remembered. In his daily routine there was little room for sentiment, and the logic of events was an effective answer in the negative to the plans and hopes entertained when he brought home the brave little woman whom he loved.

When good crops brought him a surplus of cash, he now knew that it would be needed. Gratification of personal desires for himself or wife had been postponed from time to time until they seemed both foolish and dangerous. Foolish, because when money is spent it cannot make more money; and dangerous, because expensive habits lead directly to bankruptcy, poverty and the poorhouse.

Thus he saved and worked. In the neighborhood Frank was measured by his increased acreage, his swelling cribs and his growing herds. At the bank he was considered a safe risk and any merchant would have been glad to take his note. In his home self-denial had become a fixed habit, and both himself and wife were, in a measure, reconciled to their lot. Because one cannot eat his cake and have it too, he was willing to eat as little as possible of the cake of his material possessions, so that in time of need there should be enough of it left to provide for his wife.

Because she loved her husband, Mrs. Henderson worked in unison with his point of view, and any other course would have seemed abnormal. In this way the piano, which they had talked of years before, materialized in the shape of a cottage organ; the books they wanted were never bought, and the building of their new home had been postponed from year to year until they had almost ceased to talk about it. From early morning till late at night, Frank was in the fields or away from home, and the brave little woman concealed her awful lonesomeness, because she knew his load of care was heavy enough already.

Yet when a rural telephone line went through the neighborhood, the sense of her isolation was so complete that she argued the question with Frank and, in her gentle way, tried to induce him to subscribe. Frank could see nothing in the proposition that would justify the expense. The telephone was all right for city people, but so far as the farmer was concerned it seemed to him but another device for the purpose of separating him from his earnings. He remembered the lightning rod period when his father had listened to the eloquence of an agent and had crippled himself financially for more than a year as a result thereof. He now knew that the expense was not justified by the protection provided, and that the same protection could have been secured for one-tenth the expense. He remembered how various agents for various things had extracted money from his neighbors without giving any equivalent in value except experience, and observation taught him that any article sold by an agent is to be discredtied in an exact ratio to the eloquence of the agent and the seeming necessity of the article itself.

When it came to telephones, he was particularly strong in his position. Farmers had tilled the soil since the days of Adam without the aid of a telephone, and why should he need one? In cities they might be necessary because immense metropolitan cities are a product of this age, and new conditions which are found in such cities may require the use of new devices like the telephone. The farmer, on the other hand, had no new conditions with which to contend. His farm was the same as it had always been; it was no further to his neighbors or the nearest town, and, since he had the rural free delivery of mail, he was really in constant touch with the outside world, and there seemed to be no reason whatever why a telephone was necessary. Since it was not necessary it must not be considered; further, even though it were desirable, he would wait a while.

He knew it is not good business to buy anything while it is a fad. The time to buy anything is when nobody wants it, and the time to sell when there is a keen demand. The bicycle was a case in point: when everyone wanted a bicycle they were sold for one hundred and fifty dollars; now that the craze has passed they can be bought for twenty-five dollars.

Frank had all of these answers for the arguments of his wife, and she gave up the project in deference to his better judgment and business ability. She became so imbued with his point of view that she reproached herself for having been so selfish as to argue in favor of an expense which would bring no returns except to relieve the monotony of her lonesome days. In censuring herself she reflected that she was better situated than her mother had ever been; her home was comfortable, her prospects above the average, and it was utter selfishness for her to ask for more until they could better afford it.

Frank, on his side, was imbued with that feeling of satisfaction which comes of making a decision from motives of duty. Although he would rather not refuse anything to his wife, who worked so hard and asked for so little, in this particular case her judgment had been so poor that it was impossible for him to do anything but refuse.

The next afternoon when the postman came, bringing the market reports, Frank noticed that fat hogs had reached six dollars per hundred pounds. This was the point for which he had been waiting, as he had eight ready for the market when the price should suit him. Dealers had been after him repeatedly to sell, and they predicted lower rather than higher prices. Frank had watched the price grow from four dollars seventy-five cents to five dollars, and from there, with fluctuations, gradually rise until now it had reached the point at which he had made up his mind to sell. The last fifty cents had come hard, and the struggle from five dollars fifty cents to six dollars had covered a period of nearly four weeks.

Now, however, the market seemed firm, so he drove to town that afternoon to sell the eight hogs which he had

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ready. The weather was extremely hot and the drive disagreeable, but he was rewarded by finding that the market had advanced, since the day before, to six dollars ten cents. The dealer declared that such high prices could not continue, but he was so insistent upon closing the deal that Frank became suspicious and decided that, while he would sell that week, he would take the chances on a further rise in price before the hogs were delivered. He therefore contented himself with learning the dealer expected to ship in two days from that time.

On the second day he loaded his eight fat hogs in two wagons, and with his hired man, started to town before sunup, so that the hogs would not be exposed to the extreme heat while so tightly packed in the wagons.

On the way an accident befell one of the wagons, and by the time it was repaired and they had reached town it was eleven o'clock. The hogs were very fat and the heat was so intense that two of them were in bad condition, and Frank was glad indeed when he drove up to the dealer's and unloaded.

His gladness was short lived, however, when he learned that a slump had occurred and the price had gone off to five dollars and fifty cents. The dealer also informed him that the bears were jubilant and a further slump was inevitable.

In view of the fact that two of his hogs were already suffering from the heat and might die if he reloaded and took them home, Frank decided to let them go, although he had learned to discount any statements made by hog buyers to the effect that lower prices were sure to come. As the hogs averaged four hundred pounds, Frank went home with one hundred and seventy-six dollars as the proceeds of the sale, which amount was sixteen dollars less than he would have received at six dollars per hundred, and nineteen dollars and twenty cents less than he would have received had he sold the last time he had been in town. The dealer told him the market had slumped the previous afternoon and that he had tried to get word to him, but had failed to find anyone who was going by Frank's place.

It is needless to say that Frank was not in a cheerful humor as he drove home. His luck had been bad. He did not put much faith in luck, however, but rather believed that good luck meant good judgment, and poor luck the contrary. He therefore tried to discover where his judgment had been poor, but in the end gave it up and put the best face possible on the outcome.

The next morning as he was going to the fields, one of his neighbors stopped in passing, and told him that he had just received a telephone message to the effect that the day before had developed a full-fledged wheat corner in Chicago. The Armours had been bearing the market and were short immense lines which must be covered before the first of the month, which was only four days away. As the ordinary sources of supply were in the hands of the bull operators, the Armours were paying almost any price for wheat and had raised the local market twenty cents per bushel. This neighbor was then on his way to secure help to haul his wheat to town.

Frank had one thousand bushels of wheat, which he had been holding for better prices, and was therefore able to take advantage of the fictitious values created by the battle royal which was being waged between the bulls and the bears on the board of trade. By this transaction he made two hundred dollars more than would have been possible under normal conditions.

The potency of money or success to control mental conditions was at once evident. The loss on the hogs no longer caused any feeling of chagrin. The sun seemed brighter and the world fairer; he seemed to himself to be more of a success, and the judgment which had caused him to hold his wheat until this time could be humored with lapses in small matters, since it remained steadfast in weightier affairs and proved itself to be his most valuable asset.

His neighbor, Tom Hanna, who had given him the valuable information, was not forgotten. A few days later, having learned that Mrs. Hanna was using up her accumulation of old clothes getting rags ready for the carpet weaver, Frank drove over to Hanna's with his wife early in the morning, and left Mrs. Henderson to spend the day and help with the work in hand. In the evening he drove over again after his wife, and, having invited the Hannas to Sunday dinner, started home. Mrs. Henderson was strangely quiet and sat close to Frank, holding to his arm in a nervous fashion until he noticed her manner and inquired in his kindly and affectionate voice as to what had happened and whether she had had a good time. In reply she almost sobbed and informed him that she believed it to be the happiest day of her life; that she was the most miserable woman on earth, and that she didn't see how he could love so selfish a creature, and at that, breaking down completely, she sobbed bitterly.

Frank had had but little experience with feminine nerves, as his wife was usually self-contained and cheerful, so he was alarmed and sought eagerly to find the cause of this emotion. For some time he was successful in securing nothing but sobs and self-reproaches, but finally it developed that the day had been such a contrast to the lonesome routine of her daily life, and the companionship had been so delightful that his wife was now experiencing a revulsion of feeling, and was wholly unhappy because the grey monotony of her life must be resumed. Not the least of her unhappiness was caused by the fact that in nowise was her husband to blame, and this exhibition of feeling might indicate to him both more and less than she felt.

Frank remembered that he had driven over the same road once before long years ago, under the same harvest moon, when he had pictured to his companion the happiness which should be theirs. Then, with life untried before them, they had been filled with hope and mutual trustfulness. Now, with the same companion, the feeling came over him that the pictures had not materialized, and the fulfilment of his hopes was as yet unattained.

His wife had done more than her share, and was dearer to him a thousand times than when he had driven over this same road in the days of their courtship. Yet he had made her happy then, and now she was miserable. These reflections stirred his emotions and, with his heart full of love, he sought for the cause of such undesirable conditions, with the hope that in some way he might change them and bring to both, in some degree, the realization of their earlier dreams.

Investigations developed that Mrs. Hanna had been very companionable and that the hours had flown like minutes in her company. Having made some statement on the authority of another neighbor, Mrs. Hanna had hesitated and remarked that although she thought her statement was correct, she would call up the neighbor to make sure. She had then gone to the telephone and, having placed herself in communication with her neighbor, secured a confirmation of her statement. She had then invited Mrs. Henderson to use the telephone, and for the rest of the day carpet rags had been sadly neglected. Mrs. Henderson had called up and visited with everyone she knew on the line. She had talked with more people in that one afternoon than for three months before. Mrs. Carter played for her on her new piano, other neighbors told her of events in their family and neighborhood, and she was so happy she couldn't leave the telephone. She called up their home town, Superior, four miles away, and talked with the postmistress; she even had the temerity to call up Mankato, twenty miles away on the other end of the line. Mrs. Hanna had said it did her good to see how much Mrs. Henderson enjoyed the tele-

phone, and that it reminded her of the way everyone used it the first few weeks after it was installed.

And now it was all over; such possibilities were not for her, and she reproached herself for letting the prospect make her unhappy, instead of finding happiness in the memory. Frank listened to her story, and came out strong by announcing that he would subscribe on the following day. He declared that, after all, his main mission in life was to make her happy, and that circumstances had provided an easy way in this instance by bringing him a surplus profit of two hundred dollars from the sale of his wheat, only a small fraction of which amount would be required for telephone service.

Mrs. Henderson could hardly believe her ears. When she finally realized that her husband had really decided to have a telephone she felt that he was indeed the best man that ever lived and that much was required of her to be worthy of him. The harvest moon smiled down upon them with a mellower light, and the drive of years before was forgotten in the supreme happiness of the present.

Within a week the telephone was installed and soon proved itself of value in helping Frank to make arrangements for the threshing of his wheat crop. Its value to Mrs. Henderson could not be measured by dollars; but in brighter eyes, sunnier smiles and by appreciation of her husband's love she showed in a thousand ways what it meant to her. Frank was happy in her happiness, but assumed a jocular manner in referring to it, which indicated that he did not take it seriously except as a plaything which a man of his means could afford to give to such a deserving little woman as his wife. Yet he used it to some extent every evening, and when the arrangements for threshers were made by its aid, he began to see that it was in some respects more than a plaything.

Mrs. Henderson prepared for the threshers and when they came and went to work on the first morning she was equally busy preparing their noonday meal. The hum of the machinery kept time with her busy hands and happy heart until about the middle of the forenoon when it suddenly ceased. She could not imagine why they had shut down, and going to the window to ascertain what was wrong, she saw some of the men approaching carrying one of their number. Her heart stopped beating for a moment, and with a fearful presentiment, she ran toward them. When she was close enough to see that the injured man was her husband, she gave a despairing shriek and promptly fainted.

Frank, who had been the busiest man on the place, in his hurry had caught his arm in the machinery, and the arm was now hanging limp beside him, while he had fainted from loss of blood. The men had bandaged his arm as best they could, but in spite of their efforts the blood oozed from under the bandage. One of their number took a horse and galloped wildly toward Superior to fetch the doctor. When Mrs. Henderson recovered from her faint her native nerve came to her assistance and she took charge of her husband.

She was told by the men that they had sent for the doctor, but, as she watched the blood ooze from beneath the bandage, she feared that he would come too late. She strove in vain to staunch the flow of blood, and, having failed, was well-nigh hopeless, when her heart gave a sudden bound. She went to the telephone, which she had forgotten in her excitement, called up Superior, and secured connection with Dr. Cutler's residence, where he also had his office. Mrs. Cutler answered the telephone and informed her that the doctor was in the country. This caused Mrs. Henderson almost to faint, but she had strength enough to explain briefly what had happened. Mrs. Cutler then informed her that the doctor was at Abe Roe's, visiting a sick child, and suggested that Mrs. Henderson might reach him by telephone through the switchboard.

Abe Roe lived just one mile from the Henderson place and was on another rural telephone line running into Superior. Mrs. Henderson secured connection with that line, and in a moment, having told Dr. Cutler of the accident, was informed that he would start post haste across the fields. In fifteen minutes he was there, in ten more the flow of blood was stopped, and an hour later, Frank, very white and very weak, was listening to the doctor as he told Mrs. Henderson that had he been an hour later her husband's life could not have been saved.

Now that Frank was out of danger, the men returned to their work, and lightened the toil by casting jokes at the man who went after the doctor. He reminded them, however, that they were all so crazy that it was left to a little weak woman, just recovering from a faint, to do the only effective service possible under the circumstances.

Frank's constitution was vigorous and he recovered rapidly, but the nature of his injury was so severe that he was confined to the house for many weeks. He found that time hung heavily on his hands, and the telephone was used a great deal in visiting with the neighbors. During his weeks of confinement he became better acquainted than ever before with every one in the vicinity, and the twinkle in his wife's eye spoke volumes as she saw how much their telephone was now in use.

One morning he took down the receiver to see if the line was busy, when he heard two men talking about corn. One of them was a merchant in Mankato and the other was a farmer near that town. The merchant wanted ten thousand bushels of old corn for a feeding emergency, and since most of the last year's crop had been shipped, was experiencing difficulty in getting it. The farmer did not have any, and when the conversation was ended Frank spoke to the merchant and said that he had five thousand bushels and asked what the merchant would pay. The merchant said that he would pay one cent advance over the market. Frank declined this offer, explaining that his home market at Superior was only four miles, while Mankato was twenty miles away. It would not pay him to haul his corn that distance for an advance of one cent per bushel, and, further, he expressed the opinion that prices would go higher before the new crop was marketed.

After dickering for some time, the merchant finally offered an advance of four cents per bushel, and Frank closed the deal, with the understanding that delivery should not be made for one week, thus securing delay until he would be able to make the delivery himself.

As Frank was returning from Mankato after delivering the last load of corn, he overtook Job Smith, who lived on a forty-acre farm consisting principally of hills and draws, and which resembled mountain scenery in miniature rather than farming land in a prairie country. As Job was known to have no property except an equity in his farm, Frank was astonished when, after considerable circumlocution, it developed that Job was asking for a price on the Henderson farm. He explained that he would soon receive sixteen thousand dollars which had been left him by an uncle, who had recently died. He wanted to get a larger farm and Frank's place suited him fairly well if he could get it at a price. Frank said he had no desire to sell, but that if Job wanted the Henderson half-section, and had sixteen thousand dollars in spot cash to pay for it, he might come over to see him at any time. Job protested that no land in that country was worth fifty dollars per acre, but Frank answered that his place would bring that much before he would let it go. He told his wife of the conversation, and after talking over Job's good luck, thought no more about it.

A couple of weeks later he was surprised to see Job Smith drive up to his place and to have him produce a certified check on the First National Bank of Superior for sixteen thousand dollars. Frank tried to back out, but Job insisted on construing their previous conversation as an offer, and, since the amount offered was actually ten dollars per

acre more than the current price of land in that vicinity, Frank saw no reason for not accepting.

While they were talking a man in a buggy drove by, and both recognized him as Attorney Miller of Superior. Job hailed him, and when he drove up it was found that he had with him blank deeds and time to draw the papers. Frank did not like so much hurry, and suggested that Job knew nothing about the title. Job replied that he knew both quarters had been homesteaded by Frank's father and uncle, and that no Henderson had ever mortgaged a farm or let taxes get in arrears. He wished he could say as much for himself.

Seeing no real reason for delay, Frank took Job and the attorney to the house, where the papers were soon drawn. Frank explained the situation to his wife, and she, trusting to his judgment in all matters of business, concealed the feelings which naturally arose. Here had been spent their married life; here had they worked, toiled and saved together, and here were the fruits of all their efforts. Here was home, and let it be said to the credit of the little woman that she gulped a sob as she prepared to sign and become a nomad until her lord and master should find a new home.

Frank took the pen to attach his signature when the telephone bell rang his call. He half turned to tell his wife to answer, but noticed that, with a tear in her eye, she was gazing out of the window so preoccupied with her thoughts that she was oblivious to her surroundings and had not heard the bell. Frank, therefore, laid down the pen and went to the telephone, where he at once recognized the cheery voice of Tom Hanna. Tom told him that he was in Superior; that an hour before he had gone over to the Union Hotel to keep an appointment with Mr. Deal, the stockman; while waiting in the office he picked a paper off the floor, which proved to be a carefully made map of the county, marked in such a way as to indicate there was coal underlying certain parts; that Frank's farm seemed to be the center of the deposit, and if the map was true, covered enough coal to supply the state.

While the recital of Tom's story was being made Frank's nerves were barely strong enough to enable him to hold the telephone receiver to his ear. Tom went on to say that having examined the paper he replaced it on the floor. Presently a well-dressed stranger entered the room in an excited condition as if looking for something. When he saw the paper he snatched it up, looked suspiciously around and then hurriedly went out. Tom had said nothing to anyone, but had called Frank up to tell him the story for what it was worth. Frank thanked him heartily in a voice that quivered slightly and asked Tom to come over when he reached home.

He then turned to Job and the lawyer, and in language more forcible than elegant invited them to get off his farm. Both tried to protest and to insist on closing the deal, but Frank assured them that they both ought to be in jail, and made his remarks so pointed and vigorous that they left. After they had gone, he explained matters to his wife, and thus removed from her mind the fear that he had gone violently insane.

With their secret exposed, the coal operators came into the open and began negotiations. Frank drove a hard bargain, securing a royalty of ten per cent on all coal mined and a cash payment of twenty thousand dollars as soon as the veins were developed. In consideration of a sentiment suggested by his wife, he also stipulated that the new organization should be named the Chicago Telephone Mining Company. Colonel Budd, who represented the coal operators, conceded all these points and operations began immediately.

The Chicago Telephone Mining Company is now one of the most valuable properties in the United States. It has shafts and tunnels all over that neighborhood, and the richest veins are on the old Henderson and Hanna places.

Mr. and Mrs. Henderson are realizing the dreams of their youth. They have traveled all over the world. They have secured in abundance those things for which they longed in their youth, but in the midst of their happiness and wealth they often re-visit the scene of their former life and recall with pleasure the events narrated in these pages.

A PROSPEROUS CANADIAN COMPANY.

La Compagnie de Telephone de Bellechasse of Quebec, Canada, is one of the more progressive of the Canadian Independent companies. The company has 550 miles of direct telephone line in operation, besides a number of toll lines. The principal line is from Levis to Matane, a distance of 325 miles. The largest exchange is at Levis, with 250 subscribers. The company has put the Bell practically out of business and has recently built a new fireproof exchange building. The officers of the company are George Demers, president; F. X. Anctil, vice-president, and J. F. Demers, M. D., secretary and treasurer. The capital stock is $100,000, full paid up.

NUMBERING SUBSCRIBERS.

I have a way of numbering all our farm subscribers that may be of interest to some. While I do not claim to be the first to adopt this system, I have not heard of anyone that is using one exactly the same. We letter all our farm lines instead of numbering them, and let No. 5 represent one long ring, No. 1 one short ring, No. 2 two short, No. 3 three short, and No. 4 four short rings. By this code you can make up any number of calls and the only thing that is necessary to commit to memory is that No. 5 is a long ring and Nos. 1, 2, 3 and 4 are short rings. For example:

515A equals ——— — ——— on "A" line.
4B equals — — — — on "B" line.
25BB equals — — ——— on "BB" line.

We find this system very convenient and easy for the operator. GEO. E. ATKINSON, Mgr., Creston, Iowa.

GROWTH OF TELEPHONE IMPORTATIONS FOR PHILIPPINES.

The value of the importations of electrical instruments for telephone, telegraph and other electrical purposes into the Philippine Islands is showing a steady and satisfactory increase. During the month of May last the returns show that the value of these importations was $1,287, the United Kingdom supplying the major part of that amount. During the eleven months of the fiscal year the returns show that in 1901 the value was $28,386; in 1902, $22,724, jumping again in 1903 to $72,024, the United States overwhelmingly in the lead with a total value to her credit of $59,011, Germany standing second with a total of $3,970, and France third with $2,805.

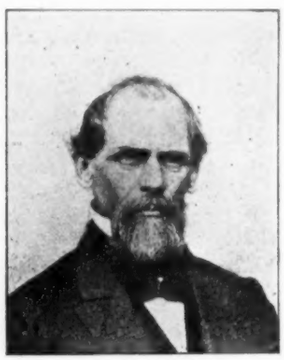
TELEPHONES FOR BELLE ISLE.

News from Quebec states that the Dominion government steamer Aberdeen, which left a short time ago for Belle Island, with supplies for those who are to winter there, will take down nine miles of copper wire to establish telephonic communication between the two ends of the island, which is a desperate mass of rock, partially covered with moss and producing no wood of any kind. As there are no poles to string telephone wire from, it will be insulated and laid over the ground. There is no telegraphic communication between the two ends of the island, and it will scarcely be possible to cross it in winter. Between the lighthouse at the west end of the island and Chateau Bay, Labrador, there is, however, a system of Marconi wireless telegraphy.

The Roebling Works

Recent excavations in Egypt show that the art of making wire was known and practiced thousands of years ago.

Just what method was employed by the ancients is a matter of conjecture, but it probably differed slightly from that in use in Europe up to the latter half of the fourteenth century. This was to beat the metal into thin sheets, which were cut into continuous strips, and these strips were rounded by hammering and filing.



JOHN A. ROEBLING.

Gold and silver were the first metals from which wire was made; the weaving of a mixture of gold wires with textile materials producing the cloth of gold of the Middle Ages.

The terms wire-smiths,—applied to men making wire with hammers; and wire-drawers,—applied to those using die plates, first appear in German records of the middle of the fourteenth century, and it is probably near this period that the steel die-plate came into use. As the wire was drawn entirely by hand, it is also probable that the advantages of the new method were not at first apparent, but sometime later in the fourteenth century a machine was made to operate by water-power and the production of wire became more of a mechanical process.

The industry seems to have flourished somewhat under the liberal policy adopted toward manufacturers by the city of Nuremberg, but it was not until nearly three centuries after the invention of the die plate that the art of wire-drawing was introduced into England. It has only been within the past century that it has become an important industry.

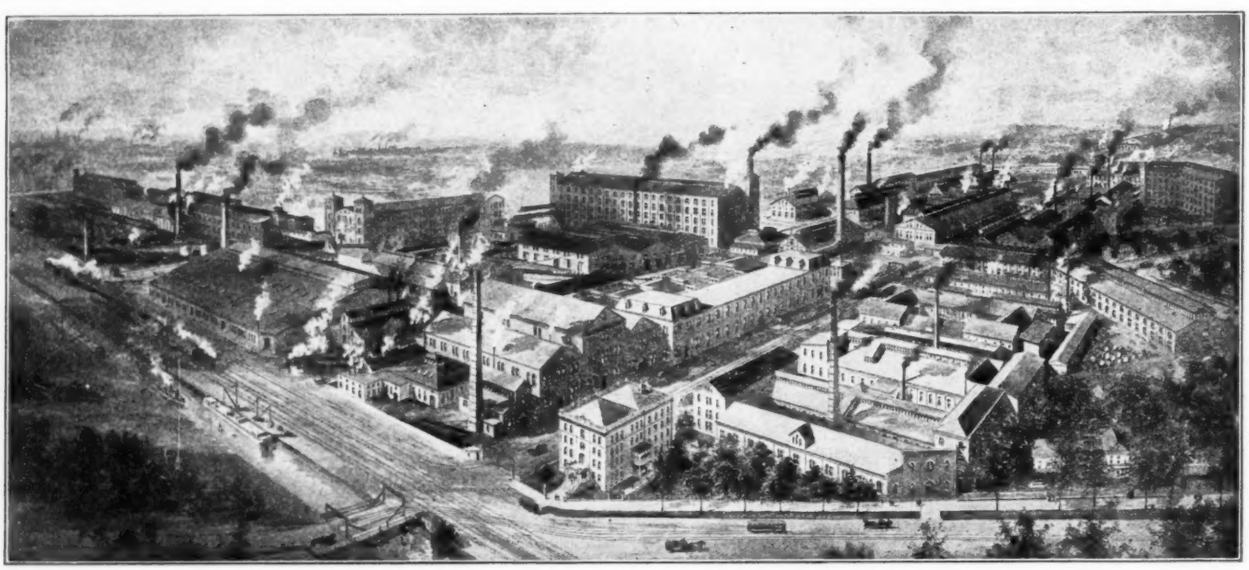
Many improvements have been made in recent years upon the appliances which had their inception in the genius of an unknown inventor, and modern methods have resulted in a product giving a service the value of which can scarcely be estimated.

The telephone, the ocean cable, the electric light, and the manifold applications of power generated by the dynamo are all directly dependent upon the knowledge and skill which produce wire from bars of steel and copper. Massive bridges are supported by wire cables, and wire ropes running thousands of feet underground have made possible the rapid development of rich stores of mineral wealth.

It is not alone in its application to the great inventions, which excite the admiration of mankind, that wire plays an important part, but it enters into the construction of numerous articles of common use. Take for example, an office in a modern office-building. The tenant touches a button and through a wire conveys a signal to the operator of the elevator, which, lifted by a wire rope, will take him to his floor. The office door is closed by the action of a wire spring. At the desk is a wire file for papers, a wire tray for letters, a wire for pens, and a wire spring beneath the chair.

At home, the bell which summons to the door is attached to a wire; there are wire screens at the windows, and vines trailing from wire baskets on the veranda. The pictures on the walls are supported by wire cords, and the pins, the needles, and many of the kitchen utensils of the housewife, are made of wire. The song of the captive bird comes through a wire cage, and the music of the piano is produced by the vibration of wires. At night, rest is sought upon a mattress made of wire, beneath which are springs of the same material.

Out-of-doors there are wires running in all directions overhead, and bicycles with wheels of wire pass swiftly by wire fences along the roadway. At the water-side men are fishing with wire hooks, from boats with shrouds and stays of wire rope. The barge behind the passing tug is towed with a wire hawser, and the steamers are steered by means of wire tiller ropes.



BIRD'S EYE VIEW OF THE ROEBLING WORKS.

These are but a few of the many uses for wire,—uses which call for different metals, and for methods of treatment of almost infinite variety. To perfect these methods, and to apply them in all instances to the proper metals, has been the aim of the Roebling Company for many years. The first problems of manufacture were met and solved in a single small shop, employing but a few men. The success which has attended the solution of subsequent problems is attested by a factory where five thousand operatives are busily engaged in the manufacture of many different kinds of wire for shipment to every part of the world.

Mr. John A. Roebling began the manufacture of wire rope at Saxonburg, Pennsylvania, in 1840. He transferred the plant and business to Trenton, N. J., in the spring of 1848.

Wire ropes for haulage purposes were made, with wires laid parallel to each other, in Germany, in 1820; stranded wire ropes, however, were not made until 1834 and did not become an important article of manufacture until subsequent to that date.

Mr. Roebling's works were the first engaged in the business in America. His plant, necessarily small at first, and equipped with simple and primitive machinery, has grown in fifty years to extensive proportions. It has had the good fortune to maintain the advantage attained by reason of being the first in the field, and has remained at the head of the industry in all respects. It is, in fact, the largest single manufactory of its kind in the world.

The buildings, yards and tracks cover more than thirty-five acres of ground, and are located about one mile from the center of Trenton. The Delaware and Raritan Canal and the Camden and Amboy Division of the Pennsylvania Railroad pass directly along the western boundary. The many operations involved in the stages of manufacture are carried on in fifty large buildings. A force of 5,000 operatives is employed, not taking into account those engaged in different parts of the country, in completing work for which the company is under contract.

Steam engines, ranging from 2,000 horsepower down, drive the machinery, and several large boiler-houses supply the necessary steam, about 10,000 horsepower being developed.

The electric-lighting station is larger than many towns possess, supplying current for 350 arc and 5,000 incandescent lamps.

The office of the company was built by Mr. Roebling in 1857 as a residence. It was subsequently given over to the uses of the business when additions to the plant encroached upon its immediate neighborhood. Eighty telephones placed in different parts of the works afford instant communication with the heads of the department, while telegraph and telephone wires carry direct to the office the messages of the outside world.

The administration of the business requires the services of one hundred and thirty persons, not including those employed at the agencies and branches, where many more are engaged.

To make an account of the processes of manufacture the more intelligible, it is necessary to start with the raw material of the leading products and follow it through the several manipulations to the finished state. Up to certain points the operations are identical for all of the articles made, but beyond, the methods diverge, and special machinery is called into play. Billets of iron, steel, copper, lead, zinc and other metals are the principal raw materials used. They are stacked in thousands of tons in the stock yard of the rolling mill, carefully arranged and marked to indicate their compositions and uses. These billets are bars about four inches square on the end, and are of varying lengths, and weigh from 100 to 400 pounds. When they are to be used, they are selected from the proper piles, loaded upon trucks and taken to reheating furnaces, in which they are placed, and there heated to the degree necessary for rolling them into wire rods.

The reheating furnaces are like ovens, and are supplied with fuel gas in connection with regenerative chambers, which afford an accurate control of temperature and an economy of fuel.

The operation of rolling consists in the conversion of billets, while hot and plastic, into wire rods, by means of successive pairs of revolving rolls with grooves, through which the advancing billets pass, and so designed as to gradually reduce the cross section of the metal under treatment to the required shape and size of wire rods, which are finally received upon coiling devices and then conveyed to a cooling floor.

The rolling mills are of the most improved form of continuous Belgian mills, permitting the use of heavy billets, making rods of great length. Four rods are treated at the same time, giving a constant stream of them, amounting to 300 tons in twenty-four hours. A portion of them is sold without further manipulation, the excellent workmanship and great range of sizes and shapes providing a ready market.

The bulk of the wire rods is, however, taken to cleaning houses, where the scale formed in rolling is removed by acid. This is in turn washed off, and the rods are coated with lime to neutralize any remaining acid, and to provide a lubricant for the next operation—wire drawing. It is accomplished by pulling the rods in the cold state through dies, by means of revolving drums upon which the wire coils as it is drawn. The process is continued through similar dies with successively smaller holes, so that the wire is gradually diminished in diameter and extended in length. Wire drawing hardens most materials so much that it is necessary to anneal the wire at various stages, and thereby restore its ductility, so it may be able to withstand further drawing. By successive annealings and drawings it may be made so fine that it weighs less than one-fourth of an ounce to the mile, and a four-inch billet about four feet long is extended to a length of 16,000 miles, while it is reduced in diameter to 1-1000 of an inch.

There are four large wire mills and several annealing houses in the works. In the annealing houses there are many rows of large iron pots, arranged beneath the floor, for convenience in charging. Coils of wire are put into the pots, which are then hermetically sealed. Heat is applied from the outside until the temperature is raised to the right point, and then the pots are allowed to cool. In this manner the wire is annealed.

Wire intended for rope is drawn with great care, the stock being previously selected with a view to the use to which the rope is to be subjected. Thorough tests and inspection are maintained throughout the entire course of manufacture, insuring both uniformity and high quality. The proper sizes of wire are picked out and prepared in coils of sufficient length for the rope which is to be made. Strands are then formed by twisting together seven, nineteen or any desired number of wires, then the strands—usually six—are closed about a hemp core to make a rope.

There are three large rope shops, equipped with the best machinery which has been evolved, through long experience, with a gratifying amount of success. Fast-running machines and so-called improvements, whose only justification is in a cheapening of cost at the expense of quality, have been studiously avoided. The capacity of the rope plant is in excess of that of any other concern, one large machine alone making a cable, in one length, weighing over eighty tons.

The galvanizing house contains the apparatus for coating wire with zinc. This is done by running wires through baths of molten zinc, causing the latter to adhere, utilizing a special, double-galvanizing process, which is superior in every respect. A tenacious and smooth coating is obtained, which gives excellent results in tests and practice. Hun-

dreds of thousands of miles of galvanized telegraph wire for the large telegraph and telephone companies, conforming to the most rigid mechanical and electrical tests, have been made in this plant. Galvanizing is applied also to common, barbed and fence wire, to wire cloth, etc. In connection with this shop is a tinning plant, in which wire is coated with tin in an analogous manner.

A very large amount of copper wire is drawn in the wire mills, which is principally used for electrical purposes. It has replaced galvanized iron wire for telegraph circuits to a considerable extent, while for telephones it is used almost exclusively. The long-distance lines between New York and Chicago, as well as a great many others, and the last Atlantic cable of the Commercial Cable Company, are equipped with Roebling copper wire.

The development of electricity for light and power, in the last ten years, has required an enormous production of trolley and insulated copper wire, the largest individual share of which has come from these works. Trolley wire is made ready for the market on reels containing, usually, one mile. The first special section of trolley wire was manufactured here with appliances designed particularly for the purpose.

Fifteen large buildings are devoted to the requirements of the electric wire department, in which every variety of electrical conductor is manufactured, from the smallest magnet wire to the heaviest submarine cable. A great variety of special machinery is used, including winding and braiding devices, standing and cabling machines, lead presses for sheathing conductors for street railway and power uses, etc.

Wire cloth and netting of every kind are made in several buildings reserved for the purpose. Woven-wire forms the basis of the Roebling fireproof construction for floors, walls and ceilings, which is used with great success in many important buildings all over the country.

Almost every year new buildings are erected to accommodate a gradually expanding business, which has resulted in the establishment of a really great plant.

The Lincoln, Nebraska, Independent Telephone System.

There is under construction at Lincoln, Nebraska, a Strowger automatic telephone system, which, if completed and in operation by January 1, 1904, as expected, will be the largest operating installation of its kind in the world, outside of Chicago. The installation consists of twenty-five miles of underground conduit; seventy miles of pole lines; thirteen miles of aerial cable; eleven miles of underground cable; 700 miles of overhead wires, and the installation of 3,000 Strowger automatic telephones, more than 150 carloads of material being used in the work.

The contract for this installation was let to The General Engineering Company, of Chicago, and it has been encouraged to use its utmost speed in the completion of this plant, by the offer of a large bonus for each day saved under the time limit allowed by the contract. How well it has carried out the wishes of the Lincoln Telephone Company in this re-

PORTABLE POWER WINCE FOR DRAWING UNDERGROUND CABLE.

gard, will be best understood by stating that ninety per cent of the work is now completed and the time elapsed since the beginning of the work is ninety-two working days.

A number of labor and time-saving devices have been designed that have contributed largely to the results secured. Among them may be mentioned a portable pole-raising derrick, which has a record of setting 102 poles, ranging from forty to fifty feet, in eight and one-half hours, with six men and one driver.

One of the devices which we believe will at once attract the attention of practical telephone men, is a portable power wince for drawing underground cable through the ducts. A cut of this device is shown on this page, the photograph having been taken just as a 450-ft. pull of 250-pr. cable was being started. The use of power for pulling underground cables has not heretofore been looked upon with much favor by telephone engineers, due undoubtedly to the absence of a device whose efficiency, safety and reliability have been proven. The fact that the machine here illustrated, though hastily constructed from plans prepared by the General Engineering Company, has pulled to date, 50,000 feet of heavy underground cable, without a single accident and without a cent of repairs on the machine itself, would seem to warrant the most conservative telephone engineer in giving this device his careful consideration.

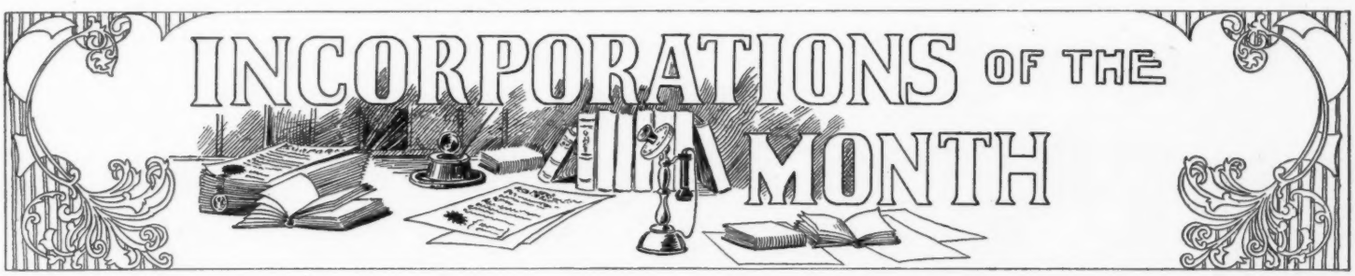
A satisfactory machine for this service must be portable, self-containing, durable and of ample power, and the first cost and maintenance must not be excessive. The record this machine has made in Lincoln, together with the view here shown of it, seems to indicate that all of these conditions have been fulfilled. The weight complete, with water and gasoline tanks full, is less than 2,600 pounds. A single team handles it easily, and on paved streets it may be moved from manhole to manhole by four men. A gasoline engine is employed, and in this particular case, the ignition spark is furnished by dry batteries, though the General Engineering Co. recommend a regular sparking dynamo for the purpose. The engine develops 6-brake H. P., at 600 r. p. m., which is the normal speed. This is geared down to a cable speed at the drum of thirty feet per minute.

Considerable attention has been given to the friction clutch, which operates the hoisting drum, and to the strap brake. The arrangement is such that the friction clutch throws itself out, unless constantly held in position by an attendant. A very slight motion of the hand, requiring no appreciable strength, disengages the clutch, and the drum instantly ceases to revolve. This clutch enables the load to be picked up slowly and the speed gradually increased to the maximum, avoiding all undue strains on engine, hoist or cable.

The gears, shafting and bed-plate are extra heavy, and all gears are protected. The consumption of gasoline is about two gallons per day, and this, with the addition of a little lubricating oil and the time of one attendant, represents the entire expense of operation.

A pull of 450 feet of 250-pr. cable is made regularly in twenty minutes, and a crew of six men and one team has pulled 5,000 feet in one day with ease. The cable speed can, of course, be increased, but it is doubtful if it is safe to pull faster than thirty feet per minute. The hauling cable is of three-quarter-inch crucible steel rope, six-strand and hemp center, nineteen wires to the strand.

In addition to its use as a cable-pulling machine, the General Engineering Company finds its gasoline engine a convenient tool for operating a concrete mixer, and for other applications about the plant. The company believes that the time made on this installation of this system has not been equaled.



Farmers' Telephone Company, Elkador, Ia.

Mutual Telephone Company, Bricelyn, Minn.

Farmers' Telephone Company, Boyleston, Ill.

Martinsburg Telephone Company, Martinsburg, Ia.

Barney Telephone Company, Barney, Ia., organized.

Columbia County Telephone Company, Benton, Pa.

Farmers' Mutual Telephone Company, Voorheis, Ia.

Riverton Telephone Company, Riverton, Ia., organized.

Farmer Telephone Company, Farmer, N. Y., organized.

Lincoln Township Telephone Company, Hutchinson, Kans.

Highland Mutual Telephone Company, Highland Center, Ia.

Pleasant Corners Telephone Company, Pleasant Corners, Ohio.

Lehigh Telephone Company, Lehigh, Ia. Capital stock, $10,000.

Albion Telephone Company, Albion, Kans. Capital stock, $1,000.

Illinois Tunnel Company, Chicago, Ill. Capital stock, $30,000,000.

Swede Southern Telephone Company, Albert City, Ia., organized.

German Southern Telephone Company, Albert City, Ia., organized.

Stanton Southwestern Telephone Company, Stanton, Ia., organized.

Alexandria Telephone Company, Alexandria, Ind. Capital stock, $8,050.

Linn Rural Telephone Company, Linn, Kans. Capital stock, $5,000.

Farmers' Telephone Company, Hamlin, Kans. Capital stock, $5,000.

Baldwin Telephone Company, Baldwin, Kans. Capital stock, $7,000.

Lawrence Telephone Company, Lawrence, Nebr. Capital stock, $1,000.

Smithville Telephone Company, Smithville, Tex. Capital stock, $10,000.

State Line Telephone Company, Weston, Mich. Capital stock, $20,000.

State Line Telephone Company, Weston, Mich. Capital stock, $20,000.

Farmers' Mutual Telephone Company, Clarinda, Ia. Capital stock, $30,000.

Crescent Telephone Company, Leesville, Ohio. Capital stock, $10,000.

Liberty and Jackson Telephone Company, Wellsboro, Pa., organized.

Farmers' Co-operative Telephone Company, Yankton, S. D., organized.

Exira and Audubon Mutual Telephone Company, Audubon, Ia., organized.

Mossman and Grant Mutual Telephone Company, Red Oak, Ia., organized.

Hokah and Mound Prairie Telephone Company, Hokah, Minn., organized.

South Hustisford Telephone Company, Hustisford, Wis. Capital stock, $300.

Milton Telephone Company, Milton, N. D., organized. Capital stock, $5,000.

Farmers' Telephone Company, Howard Lake, Minn. Capital stock, $12,500.

Freeman Rural Telephone Company, Freeman, S. D. President,

J. W. Wolf; vice-president, John Downer; secretary, O. E. Gullickson.

Grant County Telephone Company, Elbow Lake, Minn. Capital stock, $100,000.

Northern Lackawanna Telephone Company, Fleetville, Pa. Capital stock, $5,000.

Farmers' Mutual Telephone Company, Wanamingo, Minn. Capital stock, $10,000.

Republic Telephone Company, Republic City, Kans., organized. Capital stock, $2,500.

Western Independent Telephone Company, Kansas City, Mo. Capital stock, $1,000,000.

Houghton Lake Telephone Company, Houghton Lake, Mich. Capital stock, $1,500.

Hanama Telephone and Telegraph Company, Wilmington, Dela. Capital stock, $1,000,000.

North Conway and Jackson Telephone Company, North Conway, N. H. Capital stock, $5,000.

Alpena Telephone Company, Alpena, S. D. Incorporators, A. F. Smith, R. E. Dye, J. M. Johnson.

Frost Telephone Company, Washington, D. C. Incorporators, E. F. Frost, C. W. Fan der Hoogt, D. G. Clark.

Gilliam Telephone Company, Gilliam, Mo. Capital stock, $2,000. Incorporators, Jno. W. McKinney and others.

Farmers' Telephone Company, Armstrong Mo., organized. President, Asa Thompson; secretary, Bert Blousett.

Hammond Telephone Company, Hammond, Wis. Capital stock, $5,000. Incorporators, F. B. Brown and others.

Commercial Telephone Company, Gowanda, N. Y. Capital stock, $50,000. Incorporators, C. Fisher, Wm. Smallwood.

Stonewall Telephone Company, McGaheyville, Va., organized. Capital stock, $50,000. President, T. N. Armentrout.

Tyrone Telephone Company, Altay, N. Y. Capital stock, $2,500. Directors, Fred Kendall, E. U. Bigelow, Charles Losey.

Star City Telephone Company, Star City, Ind. President, W. L. Bott; vice-president, S. L. Leiter; secretary, V. B. Korner.

Farmers' Telephone Company, Chilhowee, Mo. President, J. H. Vance; secretary, Orson Scott; treasurer, Turner Johnson.

Lyman Telephone Company, Roberts, Ill. Capital stock, $5,000. Incorporators, Chris Anderson, F. S. Diller, G. W. Madden.

People's Telephone Company, Tamora, Nebr. Capital stock, $100,000. President, John R. Lawyer; secretary, S. R. Austin.

Rockhouse Telephone Company, Rockhouse, Ky., organized. Capital stock, $9,000. Incorporators, John Collins and others.

Eden Telephone Company, Eden, N. Y. Capital stock, $3,000. Incorporators, Geo. C. Bartoo, Mabel A. Bartoo, E. C. Newell.

Red River Telephone Company, Moorhead, Minn. Capital stock, $50,000. Incorporators, P. H. Lamb, L. H. Baker, Leslie Wetter.

Dryden Telephone Company, Dryden, N. Y. Capital stock, $10,000. Incorporators, John A. Wayle, Webb Corbin, Alfred Byers.

Crumbaker Telephone Company, Colfax, Wash. Capital stock, $10,000. Incorporators, M. A. Crumbaker, Thomas Neill, Bert Ray.

People's Independent Telephone Company, Rathbone, N. Y., organized. Capital stock, $5,000. Directors, F. J. Johnson and others.

Oldham Telephone Company, Oldham, Ky. Capital stock, $10,000. Incorporators, Joseph Sauer, R. B. Blakemore, R. B. Cassady.

Ozark and Cecil Telephone Company, Cecil, Ark. Capital stock, $5,000. President, Wm. Jones; secretary and treasurer, J. C. Wiggins.

Gibson Home Telephone Company, Gibson City, Ill. Capital stock, $25,000. Incorporators, A. L. Phillips, B. C. Schlosser, H. A. Ball.

Napoleon Telephone Company, Napoleon, Mo. Capital stock, $5,000. Incorporators, J. M. Hutchins, H. F. Ehlers, P. D. Williams.

Perry and Otto Telephone Company, Otto, Tex. Capital stock, $500. Incorporators, G. Reuple, T. J. Smith, J. H. Baird and others.

Bethel Local Telephone and Telegraph Company, Bethel, Me. Capital stock, $5,000. Incorporators, F. L. Edwards and D. R. Smith.

Crown Point Telephone Company, Crown Point, N. Y. Capital stock, $3,000. Incorporators, James E. Bond, F. C. Bond and Elton Dudley.

Hopkinsville Home Telephone Company, Hopkinsville, Ky. Capital stock, $100,000. Incorporators, A. W. Hoge, Gustav Hirsh, E. B. Tyler.

Heipwell Manufacturing Company, Camden, N. J. Capital stock, $100,000. Incorporators, R. H. Heipwell, Thomas Heipwell, T. H. Heipwell.

Crooksville Telephone Company, Crooksville, Ohio. Capital stock, $10,000. Incorporators, J. D. Rhodes, J. C. Moore, T. F. Wilson, S. M. Winn.

Washington City-Rural Telephone Company, Washington, Ill Capital stock, $10,000. Incorporators, C. M. Myers, P. R. Goddard, L. Garber.

Payne Home Telephone Company, Payne, Ohio. Capital stock, $15,000. Incorporators, C. E. Hyman, J. Woolard, J. W. Venrick, Fred Paul.

Eminence Home Telephone Company, Eminence, Ky. Capital stock, $25,000. Incorporators, William Callahan, W. B. Wilson, L. D. Helburn.

Conant and Parker Telephone Company, Worcester, Mass. President, Clarence Parker; vice-president, John W. Lawyer; secretary, S. R. Austin.

West Shore Telephone and Telegraph Company, Milwaukee, Wis. Capital stock, $50,000. Incorporators, J. W. Wegner, Leo Torbe, Charles L. Mann.

Farmers' Mutual Telephone Company, Hader, Minn. Capital stock, $10,000. Incorporators, L. J. Gense, A. J. Fordahl, A. C. Fregaer and others.

Port Henry Telephone Company, Port Henry, N. Y. Capital stock, $15,000. Incorporators, John R. Sherman, Aaron H. Wenton and Nestor Ehrman.

Pierson Independent Telephone Company, Pierson, Ia. Incorporators, F. J. Brooks, J. C. Pearson, F. J. Raw, F. T. Nichols, L. E. Heaton, J. H. Benson.

People's Independent Telephone Line Company, Cameron, N. Y. Capital stock, $500. Incorporators, Frank L. Johnson, William Rowyer, Griff W. Jack.

Zanesville Telephone Company, Zanesville, Ohio. Capital stock, $10,000. Incorporators, J. S. Rhodes, J. C. Moore, Thos. F. Wilson, W. Harris, S. M. Winn.

Maiden Rock and Esdaile Telephone Company, Maiden Rock, Wis., organized. President, Beverly White; secretary, Otto Holverson; treasurer, G. Bangton.

Schenectady, Delanson & Esperence Telephone Company, Schenectady, N. Y., organized. President, A. B. Cullings; treasurer, James Wingate; secretary, C. A. Cullings.

Parkwood Telephone Company, Parkwood, Pa., organized. President, T. F. Wachob; vice-president, William Craig; secretary, Thomas Anderson; treasurer, John Craig.

Williams Telephone and Supply Company, Williamstown, Ohio. Capital stock, $50,000. Incorporators, W. C. Hine, C. W. Hunt, A. A. Miller, C. J. Collins, P. G. Kassulker.

Douds-Leanda Southwestern Telephone Company, Doud's Station, Ia. Capital stock, $500. President, C. H. Dyer; vice-president, J. O. Boyer; secretary, W. F. Russell.

Asheville Telephone and Telegraph Company, Asheville, N. C. Capital stock, $300,000. Incorporators, Rush Craig, W. S. Proctor, Frank Carter, W. T. Gentry, Hunt Chipley.

Waldwick, Jonesdale and Hollendale Farmers' Telephone Company, Jonesdale, Wis. Capital stock, $4,000. Incorporators, Richard Jackson, William N. Wren, Peter Welsh.

Payne Home Telephone Company, Payne, Ohio. Capital stock, $15,000. Incorporators, Charles E. Hyman, James A. Woolard, John W. Venick, Charles A. Barber, Fred Paul.

Mitchell Telephone Company, Mitchell, Ind. Capital stock, $30,000. Incorporators, L. W. Spencer, William M. Kean, Alonzo R. Hostettler, Charles S. Coleman, William Raney.

Champlain Telephone Company, Champlain, N. Y. Capital stock, $2,000. Directors, W. O. Clark, James Burroughs, T. Dickinson, William Fraser, Hiram Briggs, W. H. Dunn and others.

Downs Western Telephone Company, Downs, Kans. Capital stock, $50,000. President C. W. Baldwin; vice-president, M. F. Hudson; secretary, R. Broderick; treasurer, J. R. Loomis.

Luna County Telephone Company, Deming, N. Mex. Capital stock, $100,000. Incorporators, Sigmund Lindauer, Newton A. Bolich, Frank DuLauney, John H. Jeffers, Chas. B. Bosworth.

Luna County Telephone and Improvement Company, Deming, N. M., organized. Capital stock, $100,000. Incorporators, Sigmund Lindauer, Newton A. Bolick, Frank Du Launey, John J. Jeffries.

Loretta and Loganville Telephone Company, Washington, Wis. Incorporators, Dr. R. C. Bremzer, Albert Proutz, Mike Fleming, Martin Sears, James Shanahan, J. L. Connor, John Quinn, John Nears, Frank Kaney, M. Quinn.

Canadian Telephone and Telegraph Company, Ottawa, Canada. Capital stock, $1,000,000. President, Charles Robinson; vice-president, Robert Bickerdike; treasurer, Jas. H. Mears; secretary, John T. C. Thompson; manager, F. J. Leonard.

Farmers' Telephone Company, Cokato, Minn. Capital stock, $12,500. Incorporators, C. B. L. Bohan, Samuel Grundahl, August Westkund, August Sahlberg, O. L. Titrud, V. N. Mellquist, G. A. Honer, Andrew Nord, C. J. Carlson.